

FAAM facility for airborne atmospheric measurements

FLIGHT FOLDER



Flight No. B373
 Date: 13 May 2008
 Take Off: 14:47:07Z
 Landing: 18:26:49Z
 Flight Time 3h39m42s

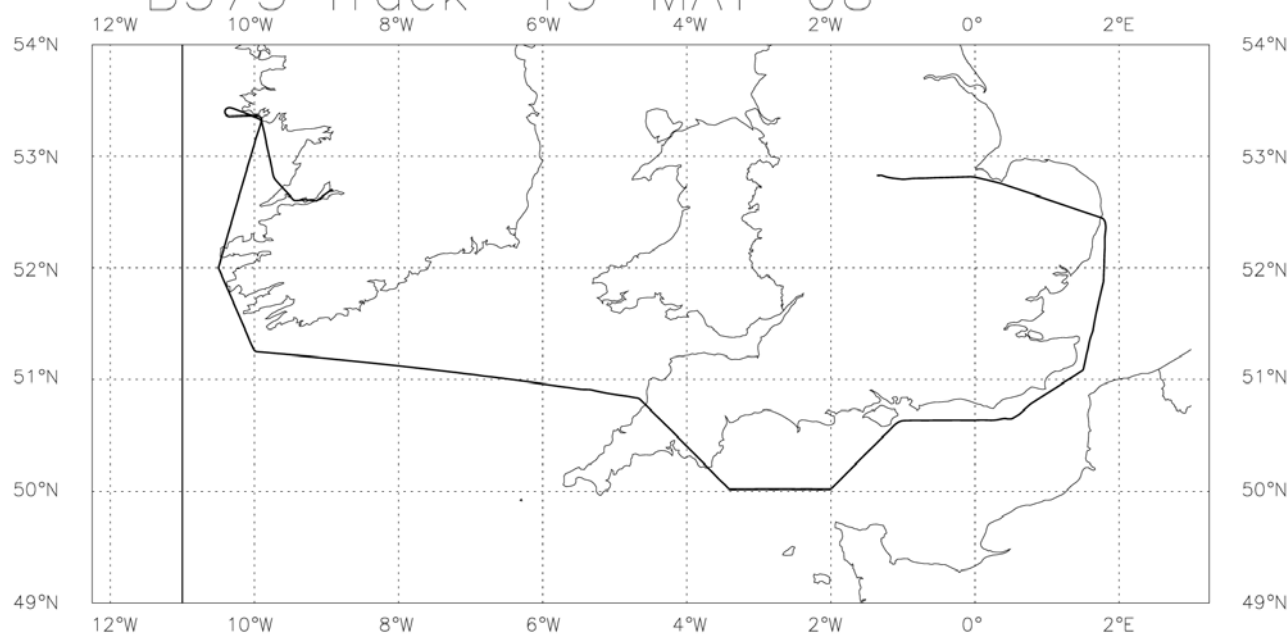
Campaign: EUCAARI

Operating Area: East Anglia, south coast of England, Irish Sea & Mace Head

POB	Position	Name	Institute	Logs y/n
1	Captain	Alan Roberts	Directflight	
2	Co-pilot	Latti Lathouwers	Directflight	
3	CCM1	Gaynor Ottaway	Directflight	
4	Mission Scientist 1	Megan Northway	University of Reading	
5	Flight Manager	Alan Woolley	FAAM	
6	Cloud Physics / CGPS / CCM2	Jim Crawford	FAAM	
7	CCN	Steve Cowan	FAAM	
8	Wet & Dry Neph / PSAP / Filters / CVI	James Bowles	Met Office	
9	SWS	Debbie O'Sullivan	Met Office	
10	AMS	Paul Williams	University of Manchester	
11	2D-S / CAPS / CPI	Dantong Liu	University of Manchester	
12	PAN / TDLAS / Core Chem	Robert Wells	FAAM	
13	Mission Scientist 2	Claire McConnell	University of Reading	
14	Engineer	Simon Tooley	Avalon	
15	DFL OPS	Peter Chappell	Directflight	
16	SP2	Ian Crawford	University of Manchester	

Flight Track:

B373 Track 13-MAY-08



FLIGHT SUMMARY

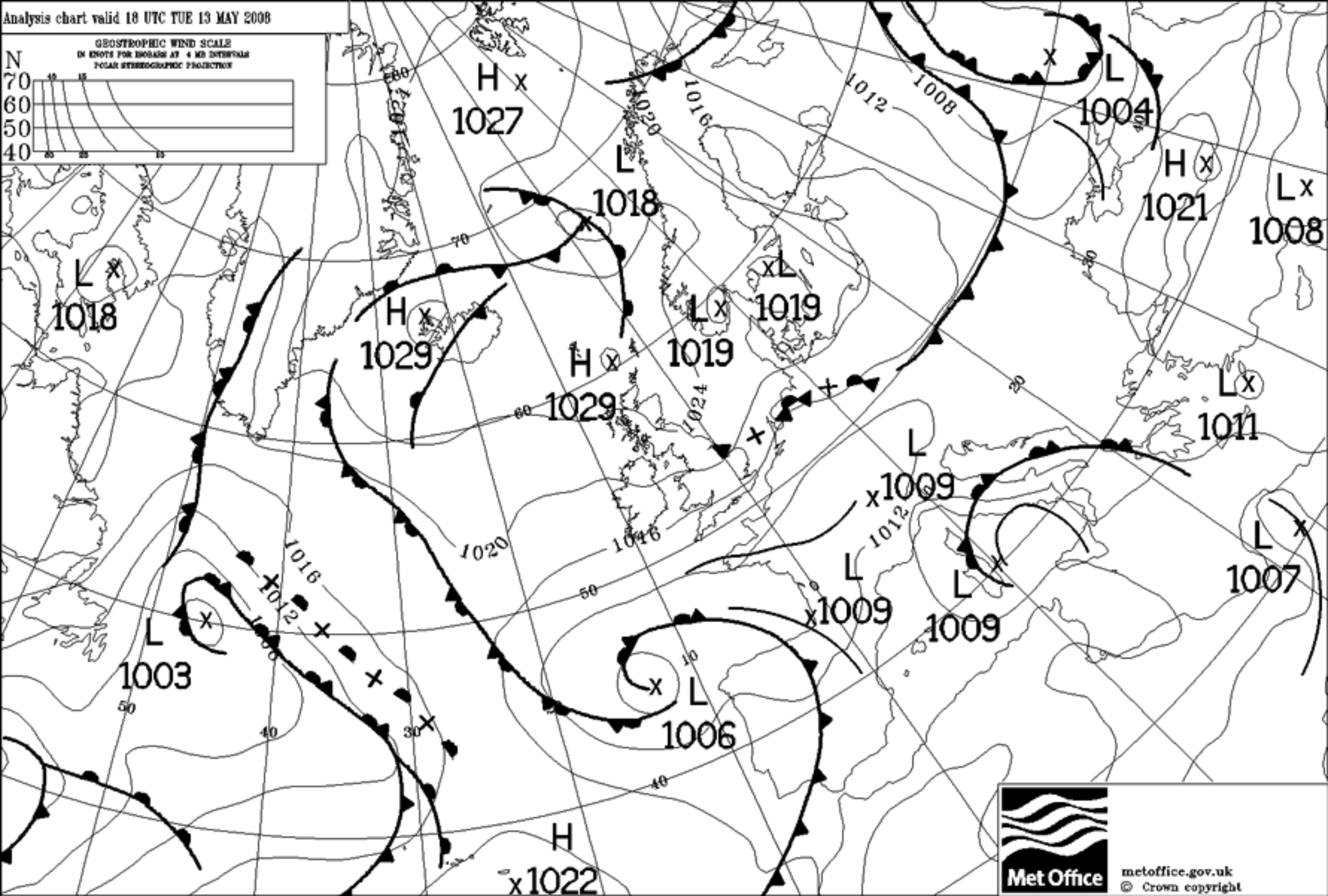
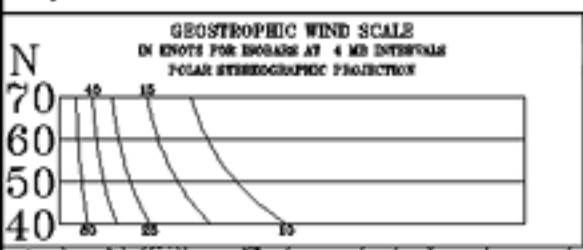
Flight No B373

Date: 13/5/08

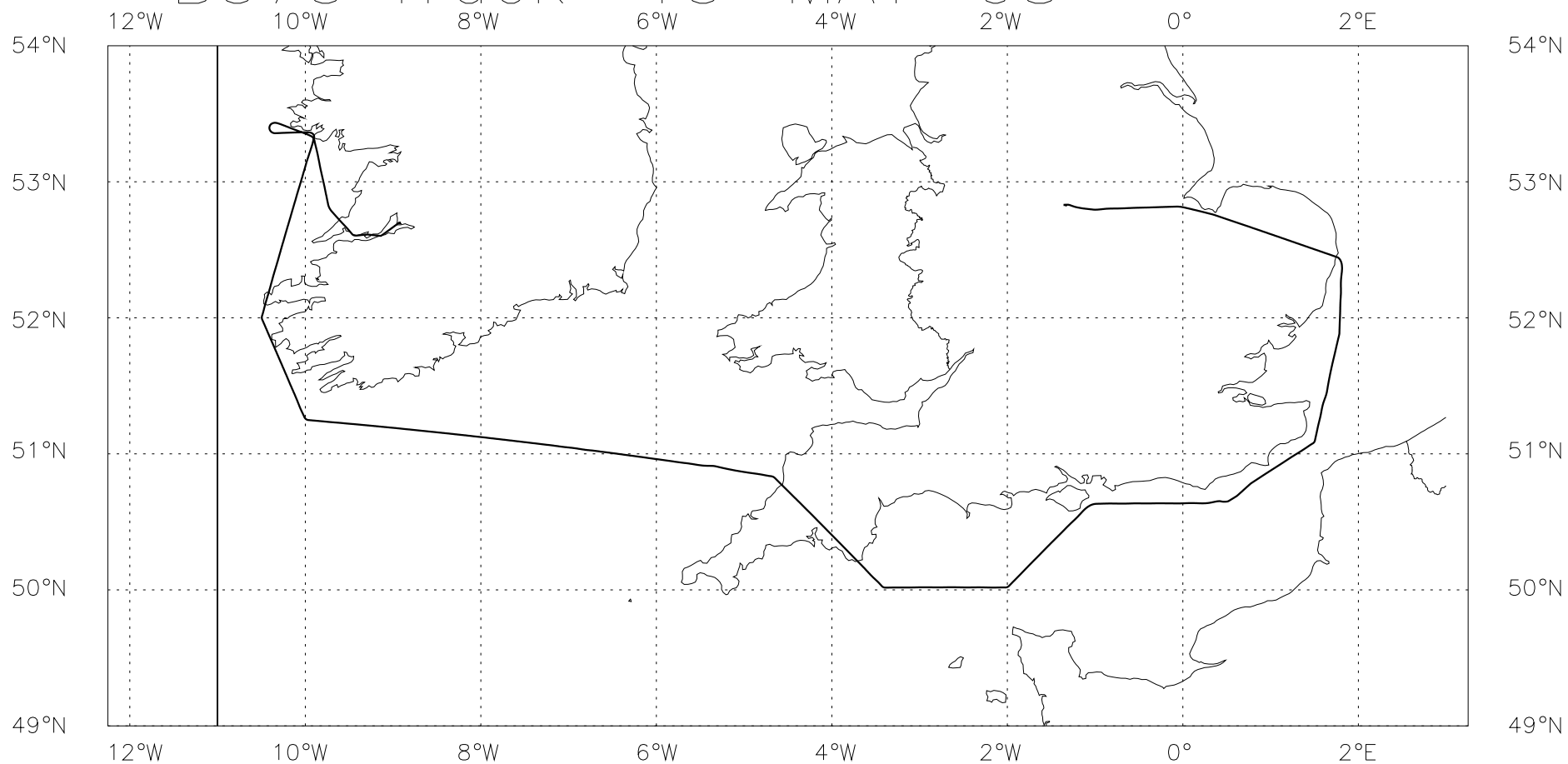
Project:EUCAARI

Location:Southern and Western coasts of UK and Ireland

Start Time	End Time	Event	Height (s)	Hdg	Comments
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143727		Start-Up	0.10 kft	177	
144421		taxy	0.10 kft	268	
144707		T/O	0.09 kft	087	
150955		jw/nevz zero	11.0 kft	109	
151327	152725	Profile 1	11.1 - -.04 kft	174	
152301		QNH	2.1 kft	188	1018
152314		rate of descent	2.0 kft	188	500 ft/min
152725	153020	Profile 2	-.04 - 2.3 kft	188	
153021	154254	Run 1	2.4 kft	186	
154254	154702	Profile 3	2.4 - 6.5 kft	226	
154702	155014	Run 2	6.5 kft	266	
155014	155309	Profile 4	6.5 - 4.0 kft	271	
155309	160530	Run 3	4.0 kft	270	
160530	160725	Profile 5	4.0 - 2.4 kft	223	
160725	162338	Run 4	2.4 kft	220	
162338	163126	Profile 6	2.4 - 10.0 kft	324	
163052		video change	9.5 kft	317	
163229	164528	Profile 7	10.0 - -.02 kft	317	
164252		QNH	1.0 kft	281	1016
164529	164824	Profile 8	-.02 - 2.4 kft	287	
164824	165900	Run 5	2.4 kft	279	
165900	170004	Profile 9	2.4 - 1.7 kft	277	
170004	172239	Run 6	1.7 kft	281	
172240	172723	Profile 10	1.7 - 4.9 kft	275	
172723	174303	Run 6	4.9 kft	275	
174303	174609	Profile 11	4.9 - 2.2 kft	019	
174609	175727	Run 7	2.2 - 0.44 kft	019	
175727	175820	Profile 12	0.44 - -.10 kft	022	
175821	180333	Profile 13	-.10 - 6.9 kft	021	
175939		abeam	1.1 kft	350	mace head
180523	180856	Profile 13	7.0 - 12.0 kft	091	end mace head
182649		Land	-.07 kft	053	at Shannon



B373 Track 13-MAY-08



EUCAARI Flight B373
FAAM sortie brief

Tuesday 13th May, 2008

1. Pilot 1 (Directflight) – Alan Roberts
2. Pilot 2 (Directflight) – Luc Lathouwers
3. CCM (Directflight) – Gaynor Ottoway
4. Core Chemistry/CCN - Jamie Trembath
5. Flight Manager – Alan Woolley
6. AMS – Paul Williams
7. Cloud Physics – Phil Rosenberg
8. SP2 – Dantong Liu
9. SWS/SHIMS – Debbie O’Sullivan
10. Wet Neph – James Bowles
11. Mission Scientist – Claire McConnell
12. Mission Scientist – Megan Northway
13. Engineer
14. Pete Chappell
15. Bob Wells

Other comments:

Take off East Midlands: 1530Z

Landing at Shannon: 2000Z

Operating Area:

West coast of England from way point 40, south coast of England, Irish Sea, south and west coast of Ireland and Mace Head.

Sortie Objectives:

In-situ sampling of a complex mixture of fresh and aged pollution over the North Sea, English Channel, Irish Sea and Atlantic and measurement of pollution around the Mace Head area.

Weather

High pressure centred to the north of Scotland with generally easterly flow. Cloud: possible low cloud over North Sea, and medium level cloud around Devon/Cornwall. Possible medium/high level cloud off the west coast of Ireland.

Flight patterns:

1. Take off East Midlands at 1530z (1630 English local)
2. Transit to way point 40 [20 min, T=0h 20]
3. Follow route around coast of England and Ireland using way points 40-41-42/J5-J6-J7-J8-J9-J10-J11-J12-J13. Manoeuvres will include a combination of saw tooth profiles and SLRs in aerosol layers. [3h 30, T=4h 10]
4. at J13 (Mace Head) descend to MPA and perform profile ascent to above aerosol layer [20 min, T=4h 30]
5. Land at Shannon airport
6. If skies are clear on landing perform a pirouette on the runway

FAAM Sortie Debrief

Flight Number B373 EUCAARI

Tuesday May 13, 2008

Mission Scientist - Megan Northway

Sortie Objectives: In situ sampling of a complex mixture of fresh and aged pollution over the North Sea, English Channel, Irish Sea and Atlantic Ocean and measurement of pollution in the Mace Head area (near Atmospheric Observatory).

Operating Area: West coast of England from waypoint 40, south coast of England, Irish Sea, south and west coast of Ireland and Mace Head.

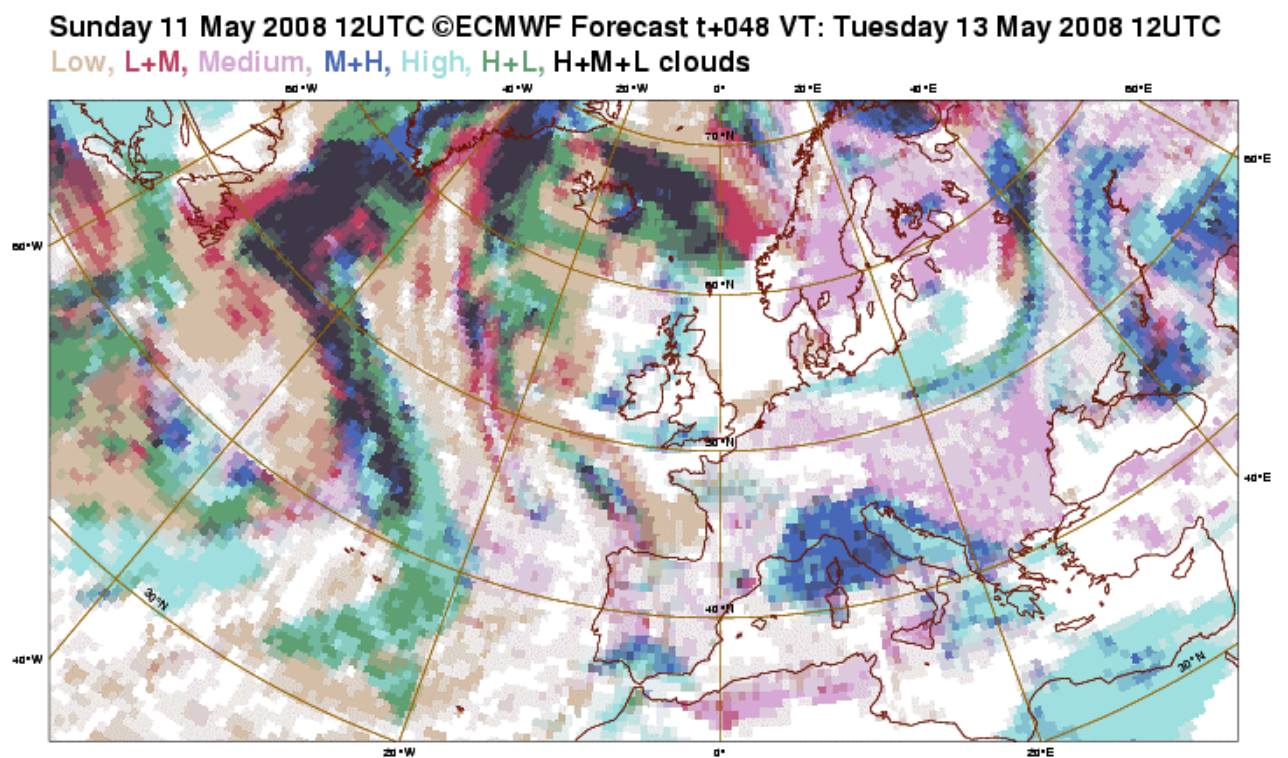
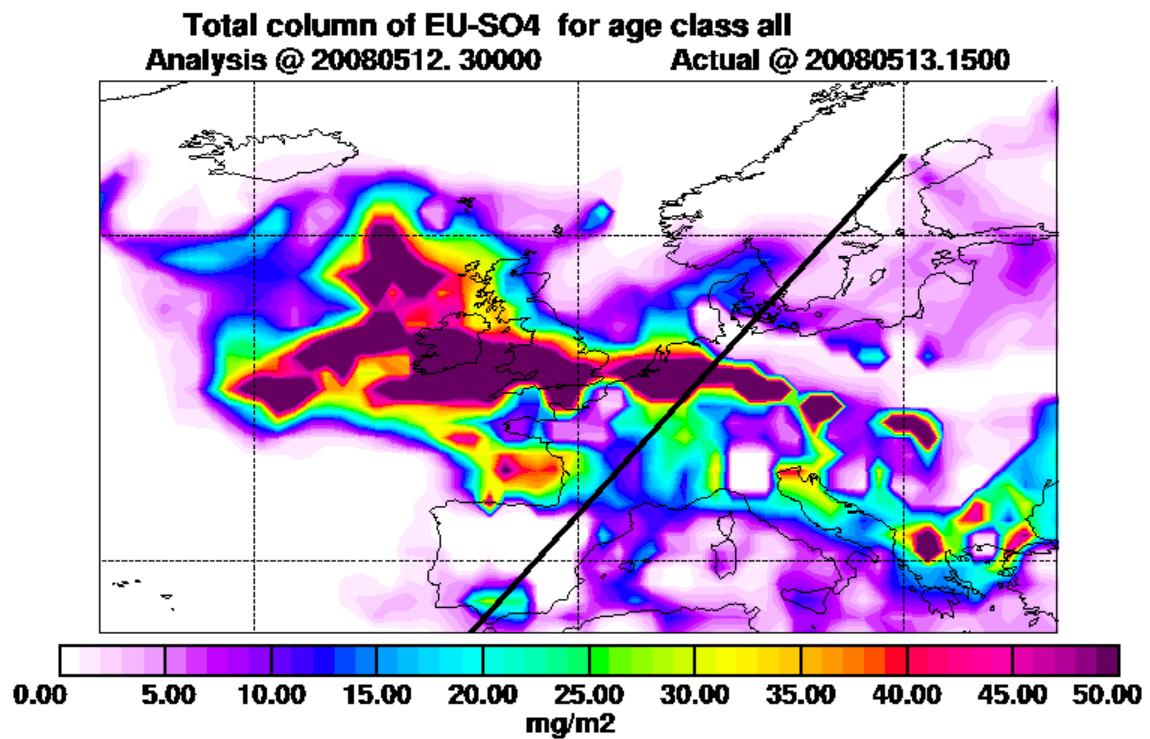
Weather: High pressure centered to the north of Scotland with generally easterly flow. Some low cloud over the North Sea and medium level cloud around Devon/Corwall. Some high cloud/cirrus off the west coast of Ireland.

Flight Patterns:

After take-off from East Midlands airport at 14:45Z, a transit at FL110 was commenced to waypoint 41. Initial profile showed a strong inversion layer to 3000 ft. As much of the fog had cleared (from B372), a profile descent was commenced to 50 ft over waypoint 41. This profile showed an aged aerosol layer between 8-5 kft and another layer between 2-4 kft. An SLR was commenced through the Channel from waypoints 41, 42 to 43 at 2500 ft followed by a sawtooth profile to 6500 ft and back to 4000 ft. Scattering at 550 nm on the nephelometer were around $22 \times 10^{-6} \text{ m}^{-1}$ at the 4000 ft level. AMS loadings were a couple of $\mu\text{g m}^{-3}$ and SMPS was showing a bimodal aerosol distribution along this track. Another sawtooth profile was performed down to 2500 ft and the run was continued at this altitude until the aircraft reached Cornwall. For the Cornwall crossing, a sawtooth profile was performed to FL120, followed by a profile descent on the other side to 50 ft over the sea. This profile showed similar aerosol levels to the previous profile, but with an elevated layer in the last 2000 ft to the surface. The SLR was continued over the Irish Sea at 1800 ft where scattering levels began to increase to $50 \times 10^{-6} \text{ m}^{-1}$ at 550 nm approaching Ireland. The SLR around the west coast of Ireland to Mace Head (J11 to J13) was completed at 5000 ft. Over the Atlantic Ocean, just to the west of Mace Head a profile descent to 50 ft was followed by a broken profile ascent to FL120. This was followed by a final pass over Mace Head at FL120 and the transit to Shannon airport at FL120. This profile showed two distinct layers of aerosol from 0 – 2 kft and 2 – 5 kft. Scattering signals (at 550 nm) were up to $90 \times 10^{-6} \text{ m}^{-1}$ suggesting sufficient levels for the radiation work proposed for tomorrow (B374). Final approach for landing was in clear skies over the river Shannon, landing at 18:20Z for an overnight.

Summary: Good aerosol flight mapping out the distributions west and south west of Ireland, including Mace Head. Aerosol levels were well predicted from the Flexpart model and promise sufficient loadings off the SW coast of Ireland for the radiation work in B374.

Instrument Problems: The CO instrument continued to exhibit problems with its breaker during the flight with several resets necessary. SP2 worked for the entire flight although was out for most of the flight during B372.



CLOUD PHYSICS LOG Flight B373

Date: 13 May 08	Operator: JC	DRS Time:	DAU1 Time:	DAU2 Time:	DAU3 Time:	Aux1 Time:	Aux2 Time:	Page 1 of 1
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[illegible]

PCASP Reference Volts =	FFSSP Reference Volts =	2D2-C End element 1 voltage =	CIP25 End element 1 voltage =	CIP100 End element 1 voltage =
PCASP Flow rate =		2D2-C End element 32 voltage =	CIP25 End element 64 voltage =	CIP100 End element 64 voltage =
© Met Office 2007	SID2 Laser power =	2D2-P End element 1 voltage =		

CLOUD PHYSICS LOG Flight B373

Date: 13 May 08	Operator: JC	DRS Time:	DAU1 Time:	DAU2 Time:	DAU3 Time:	Aux1 Time:	Aux2 Time:	Page 2 of 2
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[illegible]

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CLOUD PHYSICS LOG Flight B373

Date: 13 May 08	Operator: JC	DRS Time:	DAU1 Time:	DAU2 Time:	DAU3 Time:	Aux1 Time:	Aux2 Time:	Page 3 of 3
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[illegible]

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© Met Office 2007	SID2 Laser power =	2D2-P End element 1 voltage =		

CLOUD PHYSICS PROCESSING LOG

Flight number: B373 **T/O:** 144707
Date of flight: 13 may 2008 **Land:** 182649

A) FFSSP PROCESSING		DONE IN EXETER
Processing Stage	Done?	Comments
1) Transfer *.txt files from DVD to processing PC Bnnn_FFSSP_hh.txt for each hour of data Bnnn_FFSSP_HVMS.txt		hh = Last sec processed =
2) FTP the files (ascii) from the PC to directory PMSDATA: on FLOODS		File size =
3) FLOODS> RUN MRFB:[PMS.FAST_FSSP]FFSSP_EXTRACT_TAS a) Flight number: Bnnn b) Path name: MFDDATA:Bnnn_MFDX c) Output directory: PMSDATA: d) Start time: 0 if unknown (see comment box) e) End time: 240000 if unknown		Use time just before/after take-off/landing. If T/O /landing just after/before the hour, ensure start/end time is before/after the hour if there is an FFSSP_hh.txt file for that hour.
4) FLOODS> RUN MRFB:[PMS.FAST_FSSP]FFSSP_PROCESS_TXT a) Flight number: Bnnn b) Directory: PMSDATA: c) TAS in processing: Y d) Vel threshold (clicks) 0 e) Calibration file: Use the most recent calibration file. Format FFSSP_CALddmmyyyy.txt Calibration files to be stored in MRFB:[PMS.FAST_FSSP] f) Adjust FFSSP time Y/N g) If Y, enter value to add to data time (seconds)		Total glitches = Sec file written ok? Note calibration file used Yes only if gross errors occur in FFSSP time eg; ~ 1hour
5) FLOODS> WAVE a) WAVE> write procffssp_to_m5,'pmsdata:Bnnn_procffssp.dat', 'mfddata:Bnnn_mfdX','pmsdata:Bnnn_m5procffssp',/auto b) WAVE> exit		Use PVWAVE for this section Note time correction applied to FFSSP by /auto =
6) FLOODS> MODIFY a) Modifying datasets: pmsdata:Bnnn_m5procffssp b) Dataset: mfddata:Bnnn_mfdX c) New dataset: mfddata:Bnnn_mfdY (y=x+1) d) Parameter description file: leave blank to use default		Input file size = M5 output file size =
7) CHECKS: i). Are FFSSP and JW/Nevzorov LWC synchronized in time? In flight_plot, parameters JW LWC para 535 Nevzorov LWC para 602 FFSSP LWC para 1202 ii). If not, repeat from step 5b replacing /auto with addt=x which adds x+20 secs to FFSSP time.		Synchronized?

CLOUD PHYSICS PROCESSING LOG**Flight number: B373****Date of Flight:**

B) 2D PROCESSING		REPROCESS +1hr
Processing Stage	Done?	Comments
1) Transfer Bnnn.dat file from CD/DVD to PC		
2) Zip up file on PC (Bnnn.zip)		
3) FTP the zipped file (binary) from the PC to the directory SEADAS_DATA:[SEADAS_DATA] on FLOODS	Y	
4) Log on to FLOODS		
5) Unzip SEADAS_DATA:[SEADAS_DATA]Bnnn.zip	Y	Size of Bnnn.dat = 97684
6) FLOODS> WAVE WAVE> CONVERT_SEADAS_FILE a) Input file: SEADAS_DATA:[SEADAS_DATA]Bnnn.dat b) Output file: SEADAS_DATA:[SEADAS_DATA]Bnnn_seadas.dat WAVE> exit		Use PVWAVE for this section Blocks read = 27730 Blocks written = 27730 Bad reads = 0
7) FLOODS> RUN MRFB:[PMS.SEADAS]READM200_FILE a) Default directory: PMSDATA: b) Flight number: Bnnn c) Disk file name: SEADAS_DATA:[SEADAS_DATA]Bnnn_seadas.dat d) Comment string: e) Start time: <i>0 if unknown (T/O – 5 min)</i> f) End time: <i>240000 if unknown (Land + 5 min)</i> g) Read 2DC: Y h) Read 2DP: Y i) Secondary data: Y j) FSP-SYNC: Y k) cmd.str: Y l) Auto time correction: N m) Full length secondary: N		No 2dp Start = 144500 End = 183000 Ignore error message scroll (vestigial error from tapes) Are FRW, FSP, IMB, PCA,SEC files in PMSDATA? Are they non-zero in size?
8) FLOODS> WAVE i). WAVE> imagedisplay a) 2D directory name: PMSDATA: b) Flight number: Bnnn c) File generation no: 0 d) Time from IWC plot: N e) Select probe: (1) 2DC (2) 2DP f) Start time: <i>As in 7e above</i> g) End time: <i>As in 7f above</i> h) Time interval (sec): 5 recommended (0 for all images) ii). WAVE> auto_image a) 2D directory name: PMSDATA: b) Flight number: Bnnn c) Enter date: YYYYMMDD d) Enter start time: <i>0 if unknown (T/O – 1 min)</i> e) Enter end time: <i>240000 if unknown (Land – 1 min)</i> f) Enter time interval (sec) between successive imaged blocks: 10 iii). WAVE> exit to create files iv). FTP ascii *.PS files from PMSDATA: to PC v). Load each into Ghostview or other pdf-converter vi). Output as pdf file (720 dpi resolution), appending name prefix of CORE-CLOUD-PHY_ to converted files		2D image display and printing Must be done from FLOODS itself. <div style="border: 1px solid black; background-color: yellow; padding: 5px; margin: 10px 0;">2dp not run 2dc no images Image processing not continued</div> Note any problems with images Prepare imagery for Core data From own PC again Start = 144500 End =183000 FAAM_YYYYMMDD_R0_ Bnnn_2Dx-images.ps Notes on this in instructions

9) FLOODS> RUN MRFB:[PMS.SPEC2D.AUTO]PROCESS2D_AUTO a) Flight number: Bnnn b) Directory: PMSDATA: c) File generation: <i>Hit enter</i> d) Time correction: <i>Time offset of the 2D data</i> e) TAS: Y f) MFD directory: MFDDATA:Bnnn_tas g) Probe number: (1) 2DC (2) 2DP (0) Both <i>0 unless either probe known to be faulty</i> h) Start time: <i>0 if unknown (T/O + 30sec)</i> i) End time: <i>240000 if unknown (Land – 30sec)</i> j) Nominal averaging: 0.2 seconds for conversion to M5 k) Particle type 2DC: 8 if known to be in ice cloud 11 if known to be in water cloud l) Particle type 2DP: 8 if known to be in mixed-phase 8 if unknown m) Coefficient choice: 2 n) Output root filename: PMSDATA:Bnnn_PROC2D		NB. an error message may appear, floating point exception, rerun and use time quoted in error message, repeat until successful. X = Start = End = Time data processed to = 2dproc files present? *.2dc, *.2dp and *.dat
10) FLOODS> WAVE i) WAVE> WRITE_PROC2D_TO_M5, 'PMSDATA:BNNN_PROC2D.DAT', 'PMSDATA:BNNN_M5PROC2D' ii). exit		Use PVWAVE for this section Error message about HDDR file should be ignored. Records =
11) FLOODS> MODIFY a) Modifying datasets: pmsdata:Bnnn_m5proc2D b) Datset: mfddata:Bnnn_tas c) New dataset: mfddata:Bnnn_tas_2d d) Parameter description file: leave blank to use default		X = Y = (X+1)
12) CHECKS: Are 2DC/2DP IWC of comparable magnitude and well-correlated with Nevzorov TWC? <i>In flight_plot, parameters</i> <i>Nevzerov TWC para 605</i> <i>2DC IWC para 1302</i> <i>2DP IWC para 1312</i>	N	Use flight_plot to check data is present in mfd file?

CLOUD PHYSICS PROCESSING LOG**Flight number: B373****Date of Flight:**

C) PCASP PROCESSING		
Processing Stage	Done?	Comments
1) Complete stage 7) in 2D processing Ensures Bnnn_FSP.DAT containing raw PCASP data is written to directory PMSDATA:	y	
2) FLOODS> RUN MRFB:[PMS.PCASP]PROCPCASP_NEW a) Flight number: Bnnn b) File name: PMSDATA:Bnnn_FSP.DAT c) Root output name: PMSDATA:Bnnn_PROCPCASP Produces PMSDATA:Bnnn_PROCPCASP.DAT (binary) PMSDATA:Bnnn_PROCPCASP.OUT (ascii) d) Minimum size channel: <i>default = 1</i> <i>If smallest size channel are known to be noisy the value of the highest noise free channel to be entered here</i> e) Calibration volume flow rate: <i>Use the most recent value. (1.15ccs⁻¹ Feb 07)</i> <i>Calibration files to be stored in Exeter</i> <i>Entering zero gives default value = 1.0 cm³s⁻¹</i> f) Time correction: <i>Same value as used in 2D processing stage 9d</i> g) Start time: <i>0 if unknown</i> h) End time: <i>240000 if unknown</i>		Min size = 1 Vol flow rate = 1.15
3) FLOODS> WAVE i).WAVE> write_procpcasp_to_m5, 'pmsdata:Bnnn_procpcasp.dat', 'pmsdata:Bnnn_m5procpcasp' ii). WAVE> exit		Use PVWAVE for this section
4) FLOODS> MODIFY a) Modifying datasets: pmsdata:Bnnn_m5procpcasp b) Dataset: mfddata:Bnnn_tas_2d c) New dataset: mfddata:Bnnn_tas_2d_pcasp d) Parameter description file: <i>leave blank to use default</i>		X = Mfddata:b373_tas_pcasp
5) CHECKS Are PCASP and JW peaks synchronous? <i>In flight_plot, parameters</i> <i>Neph – total blue scatter.</i> <i>PCASP conc para 1550</i>	N	Is data present in mfd? Use flight_plot to check.

P.S.A.P. Log

Flight No. **B.373**.....

Date 13/05/08.....

Page ..1 of .1.....

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GMT	Filter Trans.	Flow Rate	$B_a \times 10^{-6}$	Ph_det levels		Run	Remarks
Set to DRS time	New filter Tr = 1.000	Set to 3.0 lpm				(30s) ? Ave = s	←Preflight
145850	1	2.59	0	16	45		Pump on
161710							pump off
161930	1	2.58	6.7	15	43		pump on
180905	.795		14.2	13	43		pump off E.O.S.

Flight No: B373

Date: 13/5/08

Operator:J Bowles

[illegible]

B374_SWS_SHIMS_EventLog.txt

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07:09:03.69 --- - - - -
07:09:03.69 --- - - - - +++ SOFTWARE START/RESTART +++
07:09:03.69 --- - - - - +++ hh:mm:ss.ff / Instr / Posn / Period /
tVIS/ tNIR / Comment +++
07:09:03.69 --- - - - - +++ Flight no. B374
07:09:03.69 --- - - - -
07:09:14.42 SWS - - - - Initialization: VIS OK NIR OK
07:09:14.51 USH - - - - Initialization: VIS OK NIR OK
07:09:14.60 LSH - - - - Initialization: VIS OK NIR OK
07:09:16.41 SWS - - - - Telescope motor initialised.
07:09:19.59 SWS 0.0 - - - - Telescope sent to -6.000
07:09:20.15 SWS -6.0 - - - - Telescope stopped.
07:09:40.92 LSH - 100 - - - - Sample period changed from 250ms to 100ms.
07:09:43.88 USH - 100 - - - - Sample period changed from 250ms to 100ms.
07:09:46.11 SWS - 100 - - - - Sample period changed from 250ms to 100ms.
07:09:47.22 SWS - - - - 5 NIR int.time changed from 5ms to 5ms.
07:09:49.16 SWS - - 50 - - VIS int.time changed from 5ms to 50ms.
07:09:49.16 SWS - - - 50 NIR int.time changed from 5ms to 50ms.
07:09:50.72 USH - - - 5 NIR int.time changed from 5ms to 5ms.
07:09:53.12 USH - - 50 - - VIS int.time changed from 5ms to 50ms.
07:09:53.12 USH - - - 50 NIR int.time changed from 5ms to 50ms.
07:09:54.77 LSH - - - 5 NIR int.time changed from 5ms to 5ms.
07:09:56.74 LSH - - 600 - - VIS int.time changed from 5ms to 600ms.
07:09:56.75 LSH - - - 600 NIR int.time changed from 5ms to 600ms.
07:09:59.47 USH - - - - Manual scene recording started.
07:09:59.48 LSH - - - - Manual scene recording started.
07:09:59.48 SWS - - - - Manual scene recording started.
07:11:22.44 SWS - - - - Dark measurement started.
07:11:22.72 SWS - - - - Warning: Abnormally bright dark measurement.
07:11:23.39 SWS - - - - Manual scene recording started.
07:11:25.07 SWS - - - - Idling
07:11:25.14 USH - - - - Idling
07:11:25.66 LSH - - - - Idling
07:11:26.78 --- - - - - Reset shutters.
07:11:30.00 SWS - - - - Manual scene recording started.
07:11:30.00 LSH - - - - Manual scene recording started.
07:11:30.02 USH - - - - Manual scene recording started.
07:11:30.73 USH - - - - Manual scene recording started.
07:11:33.52 USH - - - - Dark measurement started.
07:11:33.54 LSH - - - - Dark measurement started.
07:11:33.56 SWS - - - - Dark measurement started.
07:11:34.46 USH - - - - Manual scene recording started.
07:11:34.85 SWS - - - - Manual scene recording started.
07:11:40.15 LSH - - - - Manual scene recording started.
07:31:54.26 --- - - - - *** cooler at 9 deg
07:32:12.79 SWS - - - - Dark measurement started.
07:32:13.07 SWS - - - - Warning: Abnormally bright dark measurement.
07:32:13.76 SWS - - - - Manual scene recording started.
07:32:16.81 SWS - - - - Idling
07:32:16.82 USH - - - - Idling
07:32:16.92 LSH - - - - Idling
07:32:18.52 --- - - - - Reset shutters.
07:32:21.73 SWS - - - - Manual scene recording started.
07:32:21.74 LSH - - - - Manual scene recording started.
07:32:21.76 USH - - - - Manual scene recording started.
07:32:22.46 USH - - - - Manual scene recording started.
07:32:23.64 USH - - - - Dark measurement started.
07:32:23.68 SWS - - - - Dark measurement started.
07:32:24.00 LSH - - - - Dark measurement started.
07:32:24.58 USH - - - - Manual scene recording started.
07:32:24.77 SWS - - - - Manual scene recording started.
07:32:30.48 LSH - - - - Manual scene recording started.
07:38:07.66 --- - - - - *** 7 deg
07:40:22.28 --- - - - - *** 6 deg
07:43:35.74 --- - - - - *** 5 deg
07:47:01.26 --- - - - - *** 4 deg
07:48:19.64 USH - - - - Idling

```

07:48:19.71	SWS	-	-	-	-	Idling
07:48:19.85	LSH	-	-	-	-	Idling
07:48:22.35	---	-	-	-	-	Reset shutters.
07:48:25.56	LSH	-	-	-	-	Manual scene recording started.
07:48:25.56	USH	-	-	-	-	Manual scene recording started.
07:48:25.58	SWS	-	-	-	-	Manual scene recording started.
07:48:26.09	USH	-	-	-	-	Manual scene recording started.
07:48:26.29	SWS	-	-	-	-	Manual scene recording started.
07:48:28.16	SWS	-	-	-	-	Dark measurement started.
07:48:28.21	USH	-	-	-	-	Dark measurement started.
07:48:28.25	LSH	-	-	-	-	Dark measurement started.
07:48:29.10	SWS	-	-	-	-	Manual scene recording started.
07:48:29.33	USH	-	-	-	-	Manual scene recording started.
07:48:35.00	LSH	-	-	-	-	Manual scene recording started.
07:48:49.08	SWS	-	-	-	-	Dark measurement started.
07:48:49.09	USH	-	-	-	-	Dark measurement started.
07:48:49.58	LSH	-	-	-	-	Dark measurement started.
07:48:50.06	SWS	-	-	-	-	Manual scene recording started.
07:48:50.25	USH	-	-	-	-	Manual scene recording started.
07:48:56.04	LSH	-	-	-	-	Manual scene recording started.
08:05:29.00	---	-	-	-	-	*** 0 deg
08:10:12.35	---	-	-	-	-	*** cooled at -1 deg
08:18:00.21	USH	-	-	-	-	Idling
08:18:00.23	SWS	-	-	-	-	Idling
08:18:00.48	LSH	-	-	-	-	Idling
08:18:02.84	---	-	-	-	-	Reset shutters.
08:18:06.05	SWS	-	-	-	-	Manual scene recording started.
08:18:06.05	LSH	-	-	-	-	Manual scene recording started.
08:18:06.07	USH	-	-	-	-	Manual scene recording started.
08:18:08.33	LSH	-	-	-	-	Dark measurement started.
08:18:08.36	SWS	-	-	-	-	Dark measurement started.
08:18:08.39	USH	-	-	-	-	Dark measurement started.
08:18:09.47	SWS	-	-	-	-	Manual scene recording started.
08:18:09.68	USH	-	-	-	-	Manual scene recording started.
08:18:14.80	LSH	-	-	-	-	Manual scene recording started.
08:18:15.70	USH	-	-	-	-	Dark measurement started.
08:18:15.75	SWS	-	-	-	-	Dark measurement started.
08:18:16.25	LSH	-	-	-	-	Dark measurement started.
08:18:16.67	USH	-	-	-	-	Manual scene recording started.
08:18:16.91	SWS	-	-	-	-	Manual scene recording started.
08:18:22.69	LSH	-	-	-	-	Manual scene recording started.
08:18:22.79	---	-	-	-	-	*** -2 deg
08:23:43.00	---	-	-	-	-	*** -3 deg
08:24:54.87	LSH	-	-	-	-	Idling
08:24:54.89	USH	-	-	-	-	Idling
08:24:54.89	SWS	-	-	-	-	Idling
08:24:57.38	---	-	-	-	-	Reset shutters.
08:25:01.07	SWS	-	-	-	-	Manual scene recording started.
08:25:01.08	LSH	-	-	-	-	Manual scene recording started.
08:25:01.10	USH	-	-	-	-	Manual scene recording started.
08:25:01.90	USH	-	-	-	-	Manual scene recording started.
08:25:04.14	LSH	-	-	-	-	Dark measurement started.
08:25:04.25	SWS	-	-	-	-	Dark measurement started.
08:25:04.26	USH	-	-	-	-	Dark measurement started.
08:25:05.80	SWS	-	-	-	-	Manual scene recording started.
08:25:06.34	USH	-	-	-	-	Manual scene recording started.
08:25:10.36	USH	-	-	-	-	Dark measurement started.
08:25:10.43	SWS	-	-	-	-	Dark measurement started.
08:25:11.14	LSH	-	-	-	-	Manual scene recording started.
08:25:11.81	USH	-	-	-	-	Manual scene recording started.
08:25:12.02	SWS	-	-	-	-	Manual scene recording started.
08:25:18.58	USH	-	-	-	-	Dark measurement started.
08:25:18.61	SWS	-	-	-	-	Dark measurement started.
08:25:18.62	LSH	-	-	-	-	Dark measurement started.
08:25:20.31	USH	-	-	-	-	Manual scene recording started.
08:25:20.44	SWS	-	-	-	-	Manual scene recording started.
08:25:25.24	SWS	-	-	-	-	Dark measurement started.
08:25:25.33	USH	-	-	-	-	Dark measurement started.
08:25:25.86	LSH	-	-	-	-	Manual scene recording started.

08:25:26.80	SWS	-	-	-	-	Manual scene recording started.
08:25:26.95	USH	-	-	-	-	Manual scene recording started.
08:37:10.96	LSH	-	-	-	-	Idling
08:37:11.02	USH	-	-	-	-	Idling
08:37:11.09	SWS	-	-	-	-	Idling
08:37:14.01	---	-	-	-	-	Reset shutters.
08:37:18.43	SWS	-	-	-	-	Manual scene recording started.
08:37:18.45	LSH	-	-	-	-	Manual scene recording started.
08:37:18.47	USH	-	-	-	-	Manual scene recording started.
08:37:19.76	USH	-	-	-	-	Dark measurement started.
08:37:19.84	SWS	-	-	-	-	Dark measurement started.
08:37:20.20	LSH	-	-	-	-	Dark measurement started.
08:37:21.24	USH	-	-	-	-	Manual scene recording started.
08:37:21.77	SWS	-	-	-	-	Manual scene recording started.
08:37:27.40	LSH	-	-	-	-	Manual scene recording started.
08:37:55.36	USH	-	-	-	-	Dark measurement started.
08:37:55.36	SWS	-	-	-	-	Dark measurement started.
08:37:55.58	LSH	-	-	-	-	Dark measurement started.
08:37:56.36	USH	-	-	-	-	Manual scene recording started.
08:37:56.50	SWS	-	-	-	-	Manual scene recording started.
08:37:59.17	SWS	-	-	-	-	Dark measurement started.
08:37:59.22	USH	-	-	-	-	Dark measurement started.
08:38:00.13	SWS	-	-	-	-	Manual scene recording started.
08:38:00.35	USH	-	-	-	-	Manual scene recording started.
08:38:02.20	LSH	-	-	-	-	Manual scene recording started.
08:54:11.90	---	-	-	-	-	*** - 1 deg
08:56:46.41	---	-	-	-	-	*** -1 deg
09:11:11.42	USH	-	-	-	-	Idling
09:11:11.46	SWS	-	-	-	-	Idling
09:11:11.52	LSH	-	-	-	-	Idling
09:11:13.36	---	-	-	-	-	Reset shutters.
09:11:16.59	SWS	-	-	-	-	Manual scene recording started.
09:11:16.60	LSH	-	-	-	-	Manual scene recording started.
09:11:16.62	USH	-	-	-	-	Manual scene recording started.
09:11:17.32	USH	-	-	-	-	Manual scene recording started.
09:11:17.62	LSH	-	-	-	-	Manual scene recording started.
09:11:19.26	USH	-	-	-	-	Dark measurement started.
09:11:19.28	SWS	-	-	-	-	Dark measurement started.
09:11:19.70	LSH	-	-	-	-	Dark measurement started.
09:11:20.25	USH	-	-	-	-	Manual scene recording started.
09:11:20.42	SWS	-	-	-	-	Manual scene recording started.
09:11:22.70	USH	-	-	-	-	Dark measurement started.
09:11:22.75	SWS	-	-	-	-	Dark measurement started.
09:11:23.66	USH	-	-	-	-	Manual scene recording started.
09:11:23.88	SWS	-	-	-	-	Manual scene recording started.
09:11:26.22	LSH	-	-	-	-	Manual scene recording started.
09:11:32.35	---	-	-	-	-	*** 0 deg
09:12:17.37	---	-	-	-	-	*** 1 deg
09:20:54.82	---	-	-	-	-	*** 1 deg
09:20:57.93	SWS	-	-	-	-	Dark measurement started.
09:20:57.94	USH	-	-	-	-	Dark measurement started.
09:20:58.28	LSH	-	-	-	-	Dark measurement started.
09:20:58.91	SWS	-	-	-	-	Manual scene recording started.
09:20:59.13	USH	-	-	-	-	Manual scene recording started.
09:21:04.77	LSH	-	-	-	-	Manual scene recording started.
09:23:53.23	SWS	-	-	-	-	Dark measurement started.
09:23:53.26	USH	-	-	-	-	Dark measurement started.
09:23:53.76	LSH	-	-	-	-	Dark measurement started.
09:23:54.25	SWS	-	-	-	-	Manual scene recording started.
09:23:54.50	USH	-	-	-	-	Manual scene recording started.
09:24:00.20	LSH	-	-	-	-	Manual scene recording started.
09:24:31.04	---	-	-	-	-	*** 0 deg
09:25:17.26	LSH	-	-	-	-	Dark measurement started.
09:25:18.66	USH	-	-	-	-	Dark measurement started.
09:25:19.61	USH	-	-	-	-	Manual scene recording started.
09:25:20.80	SWS	-	-	-	-	Dark measurement started.
09:25:21.78	SWS	-	-	-	-	Manual scene recording started.
09:25:23.78	LSH	-	-	-	-	Manual scene recording started.
09:28:02.13	---	-	-	-	-	***

09:28:24.10	SWS	-6.0	-	-	-	Telescope sent to -6.000
09:28:24.72	SWS	-6.0	-	-	-	Telescope stopped.
09:28:27.05	---	-	-	-	-	*** p1
09:31:27.24	---	-	-	-	-	*** end of pirouette 1
09:43:15.73	SWS	-	-	-	-	Idling
09:43:15.81	LSH	-	-	-	-	Idling
09:43:15.90	USH	-	-	-	-	Idling
09:43:17.51	SWS	-6.0	-	-	-	Telescope sent to 174.000
09:43:19.51	SWS	173.8	-	-	-	Telescope stopped.
09:43:21.21	SWS	174.0	-	-	-	Telescope sent to -6.000
09:43:23.22	SWS	-5.9	-	-	-	Telescope stopped.
09:43:25.28	USH	-	-	-	-	Manual scene recording started.
09:43:25.28	LSH	-	-	-	-	Manual scene recording started.
09:43:25.30	SWS	-	-	-	-	Manual scene recording started.
09:43:31.07	USH	-	-	-	-	Dark measurement started.
09:43:31.12	SWS	-	-	-	-	Dark measurement started.
09:43:31.30	LSH	-	-	-	-	Dark measurement started.
09:43:31.38	USH	-	-	-	-	Warning: Abnormally bright dark measurement.
09:43:31.59	SWS	-	-	-	-	Warning: Abnormally bright dark measurement.
09:43:32.08	USH	-	-	-	-	Manual scene recording started.
09:43:32.34	LSH	-	-	-	-	Warning: Abnormally bright dark measurement.
09:43:32.36	SWS	-	-	-	-	Manual scene recording started.
09:43:36.28	SWS	-	-	-	-	Idling
09:43:36.35	USH	-	-	-	-	Idling
09:43:37.98	LSH	-	-	-	-	Manual scene recording started.
09:43:38.74	---	-	-	-	-	Reset shutters.
09:43:42.56	USH	-	-	-	-	Manual scene recording started.
09:43:42.57	SWS	-	-	-	-	Manual scene recording started.
09:43:44.85	SWS	-	-	-	-	Dark measurement started.
09:43:44.89	USH	-	-	-	-	Dark measurement started.
09:43:45.03	LSH	-	-	-	-	Dark measurement started.
09:43:45.84	SWS	-	-	-	-	Manual scene recording started.
09:43:46.03	USH	-	-	-	-	Manual scene recording started.
09:43:47.62	USH	-	-	-	-	Dark measurement started.
09:43:47.67	SWS	-	-	-	-	Dark measurement started.
09:43:48.60	USH	-	-	-	-	Manual scene recording started.
09:43:48.80	SWS	-	-	-	-	Manual scene recording started.
09:43:51.76	LSH	-	-	-	-	Manual scene recording started.
09:43:53.41	---	-	-	-	-	*** - 2 deg
09:43:55.70	USH	-	-	-	-	Dark measurement started.
09:43:55.73	LSH	-	-	-	-	Dark measurement started.
09:43:55.76	SWS	-	-	-	-	Dark measurement started.
09:43:56.66	USH	-	-	-	-	Manual scene recording started.
09:43:57.11	SWS	-	-	-	-	Manual scene recording started.
09:44:03.00	LSH	-	-	-	-	Manual scene recording started.
09:44:03.83	LSH	-	-	-	-	Manual scene recording started.
09:45:20.79	---	-	-	-	-	*** profile 1 started 09 44 56
09:45:33.80	---	-	-	-	-	*** - 3 deg
09:46:18.89	---	-	-	-	-	*** -2 deg
09:53:46.32	---	-	-	-	-	*** end of profile 1
09:55:35.48	---	-	-	-	-	*** profile descent to 50 ft
09:56:50.94	USH	-	-	-	-	Idling
09:56:51.01	SWS	-	-	-	-	Idling
09:56:51.35	LSH	-	-	-	-	Idling
09:56:52.79	SWS	-6.0	-	-	-	Telescope sent to 174.000
09:56:54.95	SWS	174.0	-	-	-	Telescope stopped.
09:57:00.93	USH	-	-	-	-	Manual scene recording started.
09:57:00.94	LSH	-	-	-	-	Manual scene recording started.
09:57:00.94	SWS	-	-	-	-	Manual scene recording started.
09:57:04.80	SWS	-	-	-	-	Dark measurement started.
09:57:04.81	USH	-	-	-	-	Dark measurement started.
09:57:05.08	LSH	-	-	-	-	Dark measurement started.
09:57:05.91	SWS	-	-	-	-	Manual scene recording started.
09:57:06.10	USH	-	-	-	-	Manual scene recording started.
09:57:11.69	LSH	-	-	-	-	Manual scene recording started.
09:57:48.72	---	-	-	-	-	*** over Mace head
09:57:55.13	---	-	-	-	-	*** -2 deg
09:58:50.55	---	-	-	-	-	*** patchy cumulus cloud around and some cirrus
10:04:31.57	---	-	-	-	-	*** interrupting profile descent

10:05:58.76	---	-	-	-	-	*** resume
10:10:52.90	---	-	-	-	-	*** 50 ft start profile climb
10:10:55.29	USH	-	-	-	-	Idling
10:10:55.34	SWS	-	-	-	-	Idling
10:10:55.51	LSH	-	-	-	-	Idling
10:10:56.88	SWS	174.0	-	-	-	Telescope sent to -6.000
10:10:58.96	SWS	-6.0	-	-	-	Telescope stopped.
10:10:59.21	SWS	-	-	-	-	Manual scene recording started.
10:10:59.24	LSH	-	-	-	-	Manual scene recording started.
10:10:59.26	USH	-	-	-	-	Manual scene recording started.
10:14:34.56	---	-	-	-	-	*** over mace head
10:15:35.60	---	-	-	-	-	*** end of profile climb
10:16:06.10	SWS	-	-	-	-	Idling
10:16:06.16	USH	-	-	-	-	Idling
10:16:06.50	LSH	-	-	-	-	Idling
10:16:07.25	---	-	-	-	-	Reset shutters.
10:16:10.53	SWS	-	-	-	-	Manual scene recording started.
10:16:10.54	LSH	-	-	-	-	Manual scene recording started.
10:16:10.57	USH	-	-	-	-	Manual scene recording started.
10:16:11.32	USH	-	-	-	-	Manual scene recording started.
10:16:11.68	USH	-	-	-	-	Dark measurement started.
10:16:11.78	SWS	-	-	-	-	Dark measurement started.
10:16:12.25	LSH	-	-	-	-	Dark measurement started.
10:16:12.66	USH	-	-	-	-	Manual scene recording started.
10:16:12.87	SWS	-	-	-	-	Manual scene recording started.
10:16:18.74	LSH	-	-	-	-	Manual scene recording started.
10:19:26.21	---	-	-	-	-	*** run
10:23:54.88	SWS	-6.0	-	-	-	Telescope sent to -5.500
10:23:55.52	SWS	-5.5	-	-	-	Telescope stopped.
10:23:56.66	SWS	-5.5	-	-	-	Telescope sent to -5.000
10:23:57.30	SWS	-5.0	-	-	-	Telescope stopped.
10:23:59.09	SWS	-5.0	-	-	-	Telescope sent to -5.500
10:23:59.69	SWS	-5.5	-	-	-	Telescope stopped.
10:24:01.18	SWS	-	-	-	-	Dark measurement started.
10:24:01.20	USH	-	-	-	-	Dark measurement started.
10:24:01.77	LSH	-	-	-	-	Dark measurement started.
10:24:02.19	SWS	-	-	-	-	Manual scene recording started.
10:24:02.39	USH	-	-	-	-	Manual scene recording started.
10:24:08.34	LSH	-	-	-	-	Manual scene recording started.
10:27:01.41	---	-	-	-	-	*** -2 deg
10:29:27.51	---	-	-	-	-	*** end of run
10:30:11.08	---	-	-	-	-	*** profile climb
10:38:59.59	---	-	-	-	-	*** end of profile climb at FL220
10:40:37.72	USH	-	-	-	-	Idling
10:40:37.75	SWS	-	-	-	-	Idling
10:40:38.33	LSH	-	-	-	-	Idling
10:40:39.58	---	-	-	-	-	Reset shutters.
10:40:42.89	LSH	-	-	-	-	Manual scene recording started.
10:40:42.90	SWS	-	-	-	-	Manual scene recording started.
10:40:42.94	USH	-	-	-	-	Manual scene recording started.
10:40:43.64	USH	-	-	-	-	Manual scene recording started.
10:40:46.21	USH	-	-	-	-	Dark measurement started.
10:40:46.25	LSH	-	-	-	-	Dark measurement started.
10:40:46.30	SWS	-	-	-	-	Dark measurement started.
10:40:47.20	USH	-	-	-	-	Manual scene recording started.
10:40:47.64	SWS	-	-	-	-	Manual scene recording started.
10:40:52.94	LSH	-	-	-	-	Manual scene recording started.
10:40:54.74	SWS	-	-	-	-	Dark measurement started.
10:40:54.83	USH	-	-	-	-	Dark measurement started.
10:40:55.03	LSH	-	-	-	-	Dark measurement started.
10:40:55.73	SWS	-	-	-	-	Manual scene recording started.
10:40:55.99	USH	-	-	-	-	Manual scene recording started.
10:41:01.66	LSH	-	-	-	-	Manual scene recording started.
10:48:03.48	---	-	-	-	-	*** correction FL 220 now (end of profile 4)
10:52:16.43	---	-	-	-	-	*** cirrus ahead looks like aged contrails
10:52:58.27	---	-	-	-	-	*** changes in SWS and USH due nto cirrus at
23000 ft (above)						
11:01:26.38	SWS	-	-	-	-	Dark measurement started.
11:01:27.40	SWS	-	-	-	-	Manual scene recording started.

11:01:28.36	USH	-	-	-	-	Dark measurement started.
11:01:29.39	USH	-	-	-	-	Manual scene recording started.
11:01:30.12	LSH	-	-	-	-	Dark measurement started.
11:01:36.61	LSH	-	-	-	-	Manual scene recording started.
11:01:41.81	LSH	-	-	-	-	Dark measurement started.
11:01:43.64	USH	-	-	-	-	Dark measurement started.
11:01:44.63	USH	-	-	-	-	Manual scene recording started.
11:01:45.22	SWS	-	-	-	-	Dark measurement started.
11:01:46.20	SWS	-	-	-	-	Manual scene recording started.
11:01:48.55	LSH	-	-	-	-	Manual scene recording started.
11:02:34.08	---	-	-	-	-	*** turning
11:02:44.19	---	-	-	-	-	*** heading towards point B
11:10:23.20	USH	-	-	-	-	Dark measurement started.
11:10:24.19	USH	-	-	-	-	Manual scene recording started.
11:10:24.78	SWS	-	-	-	-	Dark measurement started.
11:10:25.78	SWS	-	-	-	-	Manual scene recording started.
11:10:39.04	---	-	-	-	-	*** profile descent from FL 220
11:11:00.22	---	-	-	-	-	*** profile 6
11:11:15.21	---	-	-	-	-	*** from point B 51 N 13 W
11:21:19.63	---	-	-	-	-	*** interrupting profile descent to make a
reciprocal turn						
11:21:35.42	---	-	-	-	-	*** turning
11:23:04.90	---	-	-	-	-	*** resuming
11:29:38.99	SWS	-	-	-	-	Dark measurement started.
11:29:40.08	SWS	-	-	-	-	Manual scene recording started.
11:29:40.56	USH	-	-	-	-	Dark measurement started.
11:29:41.60	USH	-	-	-	-	Manual scene recording started.
11:29:41.86	LSH	-	-	-	-	Dark measurement started.
11:29:48.80	LSH	-	-	-	-	Manual scene recording started.
11:30:27.36	---	-	-	-	-	*** -1 deg
11:32:34.18	---	-	-	-	-	*** 1 deg
11:33:32.80	---	-	-	-	-	*** 50 ft
11:35:45.90	---	-	-	-	-	*** correction 50 ft now
11:36:00.17	SWS	-	-	20	-	VIS int.time changed from 50ms to 20ms.
11:36:00.17	SWS	-	-	-	20	NIR int.time changed from 50ms to 20ms.
11:36:04.83	LSH	-	-	200	-	VIS int.time changed from 600ms to 200ms.
11:36:04.84	LSH	-	-	-	200	NIR int.time changed from 600ms to 200ms.
11:36:07.04	SWS	-	-	-	-	Dark measurement started.
11:36:07.75	SWS	-	-	-	-	Manual scene recording started.
11:36:08.52	USH	-	-	-	-	Dark measurement started.
11:36:09.58	USH	-	-	-	-	Manual scene recording started.
11:36:10.54	LSH	-	-	-	-	Dark measurement started.
11:36:13.05	LSH	-	-	-	-	Manual scene recording started.
11:36:15.01	USH	-	-	30	-	VIS int.time changed from 50ms to 30ms.
11:36:15.02	USH	-	-	-	30	NIR int.time changed from 50ms to 30ms.
11:36:16.52	SWS	-	-	-	-	Dark measurement started.
11:36:17.25	SWS	-	-	-	-	Manual scene recording started.
11:36:17.89	USH	-	-	-	-	Dark measurement started.
11:36:18.65	USH	-	-	-	-	Manual scene recording started.
11:36:19.49	LSH	-	-	-	-	Dark measurement started.
11:36:22.03	LSH	-	-	-	-	Manual scene recording started.
11:36:23.24	SWS	-	-	-	-	Dark measurement started.
11:36:24.11	SWS	-	-	-	-	Manual scene recording started.
11:36:24.79	USH	-	-	-	-	Dark measurement started.
11:36:25.61	USH	-	-	-	-	Manual scene recording started.
11:36:26.61	LSH	-	-	-	-	Dark measurement started.
11:36:29.16	LSH	-	-	-	-	Manual scene recording started.
11:36:41.63	SWS	-5.5	-	-	-	Telescope sent to 0.000
11:36:42.42	SWS	0.0	-	-	-	Telescope stopped.
11:36:58.05	---	-	-	-	-	*** 2 orbits to right ba 45 deg
11:37:13.72	---	-	-	-	-	*** orbit 1
11:37:38.30	SWS	-	-	-	-	Warning: Clipping may be occurring.
11:38:16.45	---	-	-	-	-	***
11:38:17.70	SWS	-	-	10	-	VIS int.time changed from 20ms to 10ms.
11:38:17.71	SWS	-	-	-	10	NIR int.time changed from 20ms to 10ms.
11:38:41.68	---	-	-	-	-	*** end of orbit
11:38:43.78	SWS	-	-	-	-	Dark measurement started.
11:38:44.42	SWS	-	-	-	-	Manual scene recording started.
11:38:46.60	USH	-	-	-	-	Dark measurement started.

11:38:47.39	USH	-	-	-	-	Manual scene recording started.
11:38:48.17	LSH	-	-	-	-	Dark measurement started.
11:38:50.23	SWS	-	-	-	-	Dark measurement started.
11:38:50.77	LSH	-	-	-	-	Manual scene recording started.
11:38:50.84	SWS	-	-	-	-	Manual scene recording started.
11:38:52.36	USH	-	-	-	-	Dark measurement started.
11:38:53.20	USH	-	-	-	-	Manual scene recording started.
11:39:16.87	---	-	-	-	-	*** orbit 2
11:39:22.25	---	-	-	-	-	*** heading 030
11:39:41.20	---	-	-	-	-	*** 1 deg
11:40:26.61	---	-	-	-	-	*** ebd
11:40:31.48	---	-	-	-	-	*** end of orbit 2
11:40:34.45	SWS	-	-	-	-	Warning: Clipping may be occurring.
11:40:39.90	SWS	-	-	50	-	VIS int.time changed from 10ms to 50ms.
11:40:39.91	SWS	-	-	-	50	NIR int.time changed from 10ms to 50ms.
11:40:40.51	SWS	-	-	-	-	Warning: Clipping may be occurring.
11:40:43.04	USH	-	-	50	-	VIS int.time changed from 30ms to 50ms.
11:40:43.05	USH	-	-	-	50	NIR int.time changed from 30ms to 50ms.
11:40:47.06	LSH	-	-	600	-	VIS int.time changed from 200ms to 600ms.
11:40:47.08	LSH	-	-	-	600	NIR int.time changed from 200ms to 600ms.
11:40:48.93	SWS	-	-	-	-	Idling
11:40:48.96	USH	-	-	-	-	Idling
11:40:49.06	LSH	-	-	-	-	Idling
11:40:50.23	---	-	-	-	-	Reset shutters.
11:40:53.55	LSH	-	-	-	-	Manual scene recording started.
11:40:53.61	USH	-	-	-	-	Manual scene recording started.
11:40:53.62	SWS	-	-	-	-	Manual scene recording started.
11:40:54.15	USH	-	-	-	-	Manual scene recording started.
11:40:54.44	LSH	-	-	-	-	Dark measurement started.
11:40:54.48	SWS	-	-	-	-	Dark measurement started.
11:40:54.60	USH	-	-	-	-	Dark measurement started.
11:40:55.64	SWS	-	-	-	-	Manual scene recording started.
11:40:55.89	USH	-	-	-	-	Manual scene recording started.
11:40:58.89	---	-	-	-	-	*** strat oif pr
11:41:00.98	LSH	-	-	-	-	Manual scene recording started.
11:41:04.84	---	-	-	-	-	*** profile climbv
11:41:06.50	SWS	-	-	-	-	Dark measurement started.
11:41:07.50	SWS	-	-	-	-	Manual scene recording started.
11:41:07.68	USH	-	-	-	-	Dark measurement started.
11:41:08.70	USH	-	-	-	-	Manual scene recording started.
11:41:08.83	LSH	-	-	-	-	Dark measurement started.
11:41:10.23	SWS	-	-	-	-	Dark measurement started.
11:41:11.20	SWS	-	-	-	-	Manual scene recording started.
11:41:12.02	USH	-	-	-	-	Dark measurement started.
11:41:13.13	USH	-	-	-	-	Manual scene recording started.
11:41:15.44	LSH	-	-	-	-	Manual scene recording started.
11:42:29.79	SWS	-	-	30	-	VIS int.time changed from 50ms to 30ms.
11:42:29.80	SWS	-	-	-	30	NIR int.time changed from 50ms to 30ms.
11:42:32.59	USH	-	-	30	-	VIS int.time changed from 50ms to 30ms.
11:42:32.60	USH	-	-	-	30	NIR int.time changed from 50ms to 30ms.
11:42:35.12	LSH	-	-	200	-	VIS int.time changed from 600ms to 200ms.
11:42:35.13	LSH	-	-	-	200	NIR int.time changed from 600ms to 200ms.
11:42:38.37	SWS	-	-	-	-	Dark measurement started.
11:42:39.23	SWS	-	-	-	-	Manual scene recording started.
11:42:39.46	USH	-	-	-	-	Dark measurement started.
11:42:40.28	USH	-	-	-	-	Manual scene recording started.
11:42:40.78	LSH	-	-	-	-	Dark measurement started.
11:42:43.40	LSH	-	-	-	-	Manual scene recording started.
11:42:44.84	SWS	-	-	-	-	Dark measurement started.
11:42:45.70	SWS	-	-	-	-	Manual scene recording started.
11:42:46.17	USH	-	-	-	-	Dark measurement started.
11:42:46.94	USH	-	-	-	-	Manual scene recording started.
11:42:47.61	LSH	-	-	-	-	Dark measurement started.
11:42:50.16	LSH	-	-	-	-	Manual scene recording started.
11:42:52.49	---	-	-	-	-	*** start of run
11:42:55.56	---	-	-	-	-	*** at 2500 ft
11:44:14.86	LSH	-	-	-	-	Dark measurement started.
11:44:14.90	SWS	-	-	-	-	Dark measurement started.
11:44:14.91	USH	-	-	-	-	Dark measurement started.

11:44:15.94	SWS	-	-	-	-	Manual scene recording started.
11:44:16.20	USH	-	-	-	-	Manual scene recording started.
11:44:17.43	LSH	-	-	-	-	Manual scene recording started.
11:44:19.35	USH	-	-	-	-	Dark measurement started.
11:44:19.44	SWS	-	-	-	-	Dark measurement started.
11:44:19.50	LSH	-	-	-	-	Dark measurement started.
11:44:20.21	USH	-	-	-	-	Manual scene recording started.
11:44:20.36	SWS	-	-	-	-	Manual scene recording started.
11:44:22.34	LSH	-	-	-	-	Manual scene recording started.
11:44:59.25	---	-	-	-	-	*** point b
11:45:05.63	---	-	-	-	-	*** 0 deg
11:46:37.48	SWS	0.0	-	-	-	Telescope sent to -5.500
11:46:38.13	SWS	-5.5	-	-	-	Telescope stopped.
11:46:48.58	SWS	-	-	-	-	Dark measurement started.
11:46:49.42	SWS	-	-	-	-	Manual scene recording started.
11:46:50.25	USH	-	-	-	-	Dark measurement started.
11:46:51.22	USH	-	-	-	-	Manual scene recording started.
11:46:52.02	LSH	-	-	-	-	Dark measurement started.
11:46:54.50	LSH	-	-	-	-	Manual scene recording started.
11:50:36.08	---	-	-	-	-	*** -1 deg
11:56:01.91	---	-	-	-	-	*** -2 deg
12:02:57.27	---	-	-	-	-	*** A now 11.39 W
12:03:05.75	---	-	-	-	-	*** end of run
12:03:23.48	---	-	-	-	-	*** -3 deg
12:03:40.62	SWS	-	-	10	-	VIS int.time changed from 30ms to 10ms.
12:03:40.63	SWS	-	-	-	10	NIR int.time changed from 30ms to 10ms.
12:03:44.05	SWS	-	-	-	-	Dark measurement started.
12:03:44.64	SWS	-	-	-	-	Manual scene recording started.
12:03:47.40	USH	-	-	20	-	VIS int.time changed from 30ms to 20ms.
12:03:47.41	USH	-	-	-	20	NIR int.time changed from 30ms to 20ms.
12:03:48.48	USH	-	-	-	-	Dark measurement started.
12:03:49.23	USH	-	-	-	-	Manual scene recording started.
12:03:54.44	LSH	-	-	-	-	Dark measurement started.
12:03:56.07	SWS	-	-	-	-	Dark measurement started.
12:03:56.64	SWS	-	-	-	-	Manual scene recording started.
12:03:56.95	LSH	-	-	-	-	Manual scene recording started.
12:03:57.53	USH	-	-	-	-	Dark measurement started.
12:03:58.26	USH	-	-	-	-	Manual scene recording started.
12:04:00.59	SWS	-	-	-	-	Dark measurement started.
12:04:01.19	SWS	-	-	-	-	Manual scene recording started.
12:04:02.04	USH	-	-	-	-	Dark measurement started.
12:04:02.78	USH	-	-	-	-	Manual scene recording started.
12:04:38.20	---	-	-	-	-	*** profile descent
12:04:41.76	---	-	-	-	-	*** to 500 ft
12:04:50.55	---	-	-	-	-	*** profile 9
12:08:34.94	SWS	-5.5	-	-	-	Telescope sent to 0.000
12:08:35.58	SWS	-0.0	-	-	-	Telescope stopped.
12:09:05.85	---	-	-	-	-	*** orbit 1 330 ba 43 deg
12:09:15.60	---	-	-	-	-	*** heading 330
12:10:16.05	---	-	-	-	-	*** end of orbit 1
12:11:04.08	---	-	-	-	-	*** orbit 4 050
12:12:25.54	---	-	-	-	-	*** end of orbit 4
12:12:31.70	---	-	-	-	-	*** -3 deg
12:12:34.30	SWS	0.0	-	-	-	Telescope sent to -5.500
12:12:34.93	SWS	-5.5	-	-	-	Telescope stopped.
12:12:38.20	SWS	-	-	-	-	Dark measurement started.
12:12:38.79	SWS	-	-	-	-	Manual scene recording started.
12:12:39.52	USH	-	-	-	-	Dark measurement started.
12:12:40.26	USH	-	-	-	-	Manual scene recording started.
12:12:40.51	LSH	-	-	-	-	Dark measurement started.
12:12:43.13	LSH	-	-	-	-	Manual scene recording started.
12:12:55.06	SWS	-	-	30	-	VIS int.time changed from 10ms to 30ms.
12:12:55.09	SWS	-	-	-	30	NIR int.time changed from 10ms to 30ms.
12:12:58.26	USH	-	-	30	-	VIS int.time changed from 20ms to 30ms.
12:12:58.27	USH	-	-	-	30	NIR int.time changed from 20ms to 30ms.
12:12:59.88	SWS	-	-	-	-	Dark measurement started.
12:13:00.86	SWS	-	-	-	-	Manual scene recording started.
12:13:01.30	USH	-	-	-	-	Dark measurement started.
12:13:02.13	USH	-	-	-	-	Manual scene recording started.

12:13:03.09	LSH	-	-	-	-	Dark measurement started.
12:13:04.42	SWS	-	-	-	-	Dark measurement started.
12:13:05.26	SWS	-	-	-	-	Manual scene recording started.
12:13:05.64	LSH	-	-	-	-	Manual scene recording started.
12:13:06.17	USH	-	-	-	-	Dark measurement started.
12:13:07.06	USH	-	-	-	-	Manual scene recording started.
12:13:07.41	USH	-	-	-	-	Manual scene recording started.
12:13:46.56	SWS	-	-	-	-	Warning: Clipping may be occurring.
12:16:40.22	---	-	-	-	-	*** profile descent to 50
12:17:42.84	---	-	-	-	-	*** 50 ft, profile climb to 100 ft
12:19:02.70	---	-	-	-	-	*** start of run at 100 ft
12:20:33.40	---	-	-	-	-	*** -3 deg
12:23:46.17	---	-	-	-	-	*** reciprocal run at 100 ft will be marked by
the stopping and moving of the telescope						
12:26:36.54	---	-	-	-	-	*** passing point B
12:27:14.47	SWS	-	-	-	-	Dark measurement started.
12:27:15.37	SWS	-	-	-	-	Manual scene recording started.
12:27:18.51	USH	-	-	-	-	Dark measurement started.
12:27:19.34	USH	-	-	-	-	Manual scene recording started.
12:27:20.82	LSH	-	-	-	-	Dark measurement started.
12:27:23.58	LSH	-	-	-	-	Manual scene recording started.
12:28:04.06	USH	-	-	-	-	Idling
12:28:04.15	SWS	-	-	-	-	Idling
12:28:04.20	LSH	-	-	-	-	Idling
12:28:06.19	SWS	-5.5	-	-	-	Telescope sent to 174.500
12:28:08.34	SWS	174.5	-	-	-	Telescope stopped.
12:28:09.68	USH	-	-	-	-	Manual scene recording started.
12:28:09.70	LSH	-	-	-	-	Manual scene recording started.
12:28:09.71	SWS	-	-	-	-	Manual scene recording started.
12:28:26.34	SWS	-	-	50	-	VIS int.time changed from 30ms to 50ms.
12:28:26.35	SWS	-	-	-	50	NIR int.time changed from 30ms to 50ms.
12:28:28.14	SWS	-	-	-	-	Dark measurement started.
12:28:29.22	SWS	-	-	-	-	Manual scene recording started.
12:28:29.92	USH	-	-	-	-	Dark measurement started.
12:28:30.79	USH	-	-	-	-	Manual scene recording started.
12:28:31.41	LSH	-	-	-	-	Dark measurement started.
12:28:33.73	SWS	-	-	-	-	Dark measurement started.
12:28:34.10	LSH	-	-	-	-	Manual scene recording started.
12:28:34.86	SWS	-	-	-	-	Manual scene recording started.
12:28:35.49	USH	-	-	-	-	Dark measurement started.
12:28:36.48	USH	-	-	-	-	Manual scene recording started.
12:28:37.53	SWS	-	-	-	-	Dark measurement started.
12:28:38.53	SWS	-	-	-	-	Manual scene recording started.
12:28:39.61	LSH	-	-	-	-	Dark measurement started.
12:28:42.27	LSH	-	-	-	-	Manual scene recording started.
12:28:44.60	SWS	-	-	-	-	Dark measurement started.
12:28:45.86	SWS	-	-	-	-	Manual scene recording started.
12:28:47.75	SWS	-	-	-	-	Dark measurement started.
12:28:48.94	SWS	-	-	-	-	Manual scene recording started.
12:29:58.52	---	-	-	-	-	*** start of reciprocal run at 100 ft
12:30:23.83	---	-	-	-	-	*** run 4
12:40:00.05	---	-	-	-	-	*** end of run 4 profile ascent
12:40:01.61	SWS	-	-	-	-	Idling
12:40:01.65	USH	-	-	-	-	Idling
12:40:01.69	LSH	-	-	-	-	Idling
12:40:03.40	SWS	174.5	-	-	-	Telescope sent to -5.500
12:40:05.54	SWS	-5.5	-	-	-	Telescope stopped.
12:40:06.90	USH	-	-	-	-	Manual scene recording started.
12:40:06.91	LSH	-	-	-	-	Manual scene recording started.
12:40:06.93	SWS	-	-	-	-	Manual scene recording started.
12:40:11.12	SWS	-	-	-	-	Dark measurement started.
12:40:12.32	SWS	-	-	-	-	Manual scene recording started.
12:40:12.64	USH	-	-	-	-	Dark measurement started.
12:40:13.45	USH	-	-	-	-	Manual scene recording started.
12:40:13.95	LSH	-	-	-	-	Dark measurement started.
12:40:16.46	LSH	-	-	-	-	Manual scene recording started.
12:40:20.82	---	-	-	-	-	*** profile 11
12:40:23.98	SWS	-	-	30	-	VIS int.time changed from 50ms to 30ms.
12:40:23.99	SWS	-	-	-	30	NIR int.time changed from 50ms to 30ms.

12:40:25.21	SWS	-	-	-	-	Dark measurement started.
12:40:26.05	SWS	-	-	-	-	Manual scene recording started.
12:40:26.99	SWS	-	-	-	-	Dark measurement started.
12:40:27.87	SWS	-	-	-	-	Manual scene recording started.
12:40:28.72	SWS	-	-	-	-	Dark measurement started.
12:40:29.60	SWS	-	-	-	-	Manual scene recording started.
12:43:56.56	SWS	-	-	-	-	Dark measurement started.
12:43:57.45	SWS	-	-	-	-	Manual scene recording started.
12:43:58.22	USH	-	-	-	-	Dark measurement started.
12:43:59.05	USH	-	-	-	-	Manual scene recording started.
12:44:02.50	LSH	-	-	-	-	Dark measurement started.
12:44:05.36	LSH	-	-	-	-	Manual scene recording started.
12:44:09.31	SWS	-	-	-	-	Dark measurement started.
12:44:10.23	SWS	-	-	-	-	Manual scene recording started.
12:44:10.76	USH	-	-	-	-	Dark measurement started.
12:44:11.61	USH	-	-	-	-	Manual scene recording started.
12:44:12.56	LSH	-	-	-	-	Dark measurement started.
12:44:15.05	LSH	-	-	-	-	Manual scene recording started.
12:46:44.64	---	-	-	-	-	*** en dof profile climb
12:46:50.73	---	-	-	-	-	*** turning
12:49:50.86	---	-	-	-	-	*** start of run 5 at 6500 ft
12:50:06.18	---	-	-	-	-	*** correction FL 60 (6000 ft)
12:57:07.75	---	-	-	-	-	*** -3 deg
12:58:03.62	SWS	-	-	-	-	Dark measurement started.
12:58:04.44	SWS	-	-	-	-	Manual scene recording started.
12:58:05.71	USH	-	-	-	-	Dark measurement started.
12:58:06.67	USH	-	-	-	-	Manual scene recording started.
12:58:07.16	LSH	-	-	-	-	Dark measurement started.
12:58:09.70	LSH	-	-	-	-	Manual scene recording started.
12:58:09.87	SWS	-	-	-	-	Dark measurement started.
12:58:10.82	SWS	-	-	-	-	Manual scene recording started.
12:58:11.60	USH	-	-	-	-	Dark measurement started.
12:58:12.50	USH	-	-	-	-	Manual scene recording started.
12:58:13.38	LSH	-	-	-	-	Dark measurement started.
12:58:15.93	LSH	-	-	-	-	Manual scene recording started.
13:00:08.86	SWS	-	-	-	-	Idling
13:00:08.91	LSH	-	-	-	-	Idling
13:00:08.95	USH	-	-	-	-	Idling
13:00:13.29	SWS	-5.5	-	-	-	Telescope sent to 174.500
13:00:15.51	SWS	174.5	-	-	-	Telescope stopped.
13:00:21.66	SWS	-	-	-	-	Manual scene recording started.
13:00:21.67	LSH	-	-	-	-	Manual scene recording started.
13:00:21.71	USH	-	-	-	-	Manual scene recording started.
13:01:47.37	LSH	-	-	-	-	Idling
13:01:47.46	USH	-	-	-	-	Idling
13:01:47.55	SWS	-	-	-	-	Idling
13:01:49.80	SWS	174.5	-	-	-	Telescope sent to -5.500
13:01:51.99	SWS	-5.5	-	-	-	Telescope stopped.
13:01:53.03	LSH	-	-	-	-	Manual scene recording started.
13:01:53.03	USH	-	-	-	-	Manual scene recording started.
13:01:53.05	SWS	-	-	-	-	Manual scene recording started.
13:01:56.34	SWS	-	-	-	-	Dark measurement started.
13:01:57.29	SWS	-	-	-	-	Manual scene recording started.
13:01:58.28	USH	-	-	-	-	Dark measurement started.
13:01:59.15	USH	-	-	-	-	Manual scene recording started.
13:02:00.01	LSH	-	-	-	-	Dark measurement started.
13:02:02.56	LSH	-	-	-	-	Manual scene recording started.
13:02:59.86	---	-	-	-	-	*** profile ascent from B to A at F
13:03:07.36	---	-	-	-	-	*** 1 220
13:07:46.76	SWS	-	-	50	-	VIS int.time changed from 30ms to 50ms.
13:07:46.80	SWS	-	-	-	50	NIR int.time changed from 30ms to 50ms.
13:07:49.01	SWS	-	-	-	-	Dark measurement started.
13:07:49.99	SWS	-	-	-	-	Manual scene recording started.
13:07:51.19	USH	-	-	-	-	Dark measurement started.
13:07:52.07	USH	-	-	-	-	Manual scene recording started.
13:07:53.90	LSH	-	-	-	-	Dark measurement started.
13:07:56.31	SWS	-	-	-	-	Dark measurement started.
13:07:56.48	LSH	-	-	-	-	Manual scene recording started.
13:07:57.56	SWS	-	-	-	-	Manual scene recording started.

13:07:58.79	USH	-	-	-	-	Dark measurement started.
13:07:59.69	USH	-	-	-	-	Manual scene recording started.
13:08:01.01	LSH	-	-	-	-	Dark measurement started.
13:08:03.71	LSH	-	-	-	-	Manual scene recording started.
13:08:04.32	SWS	-	-	-	-	Dark measurement started.
13:08:05.41	SWS	-	-	-	-	Manual scene recording started.
13:14:13.27	---	-	-	-	-	*** interrupt profile climb
13:14:18.82	---	-	-	-	-	*** at FL 170
13:16:38.19	SWS	-	-	10	-	VIS int.time changed from 50ms to 10ms.
13:16:38.20	SWS	-	-	-	10	NIR int.time changed from 50ms to 10ms.
13:16:40.27	SWS	-	-	-	-	Dark measurement started.
13:16:40.96	SWS	-	-	-	-	Manual scene recording started.
13:16:46.26	SWS	-	-	15	-	VIS int.time changed from 10ms to 15ms.
13:16:46.27	SWS	-	-	-	15	NIR int.time changed from 10ms to 15ms.
13:16:50.63	SWS	-	-	20	-	VIS int.time changed from 15ms to 20ms.
13:16:50.65	SWS	-	-	-	20	NIR int.time changed from 15ms to 20ms.
13:16:51.70	SWS	-	-	-	-	Dark measurement started.
13:16:52.54	SWS	-	-	-	-	Manual scene recording started.
13:16:53.02	SWS	-	-	-	-	Dark measurement started.
13:16:53.80	SWS	-	-	-	-	Manual scene recording started.
13:17:07.81	---	-	-	-	-	*** profile 12 resumed
13:25:19.08	SWS	-5.5	-	-	-	Telescope sent to 0.000
13:25:19.76	SWS	0.0	-	-	-	Telescope stopped.
13:25:22.30	SWS	-	-	-	-	Dark measurement started.
13:25:23.09	SWS	-	-	-	-	Manual scene recording started.
13:25:23.72	USH	-	-	-	-	Dark measurement started.
13:25:24.69	USH	-	-	-	-	Manual scene recording started.
13:25:31.95	---	-	-	-	-	*** FL 240
13:26:27.61	SWS	-	-	-	-	Warning: Clipping may be occurring.
13:26:32.17	---	-	-	-	-	*** orbit 5 ba 43 deg to the right
13:26:33.37	SWS	-	-	10	-	VIS int.time changed from 20ms to 10ms.
13:26:33.40	SWS	-	-	-	10	NIR int.time changed from 20ms to 10ms.
13:26:41.01	---	-	-	-	-	*** heading 120 dstart now
13:28:30.60	---	-	-	-	-	*** end of orbit 5
13:28:34.38	SWS	-	-	20	-	VIS int.time changed from 10ms to 20ms.
13:28:34.39	SWS	-	-	-	20	NIR int.time changed from 10ms to 20ms.
13:28:35.68	SWS	-	-	-	-	Dark measurement started.
13:28:36.55	SWS	-	-	-	-	Manual scene recording started.
13:28:40.54	SWS	0.0	-	-	-	Telescope sent to -5.500
13:28:41.20	SWS	-5.5	-	-	-	Telescope stopped.
13:29:00.60	---	-	-	-	-	*** orbit 6 160
13:30:51.66	---	-	-	-	-	*** end of orbit 6
13:31:00.83	SWS	-	-	-	-	Dark measurement started.
13:31:01.66	SWS	-	-	-	-	Manual scene recording started.
13:31:02.12	USH	-	-	-	-	Dark measurement started.
13:31:03.29	USH	-	-	-	-	Manual scene recording started.
13:31:03.66	LSH	-	-	-	-	Dark measurement started.
13:31:06.18	LSH	-	-	-	-	Manual scene recording started.
13:31:07.42	SWS	-	-	10	-	VIS int.time changed from 20ms to 10ms.
13:31:07.45	SWS	-	-	-	10	NIR int.time changed from 20ms to 10ms.
13:31:09.00	SWS	-	-	-	-	Dark measurement started.
13:31:09.69	SWS	-	-	-	-	Manual scene recording started.
13:31:10.64	SWS	-	-	-	-	Dark measurement started.
13:31:11.35	SWS	-	-	-	-	Manual scene recording started.
13:31:12.22	SWS	-	-	-	-	Dark measurement started.
13:31:12.88	SWS	-	-	-	-	Manual scene recording started.
13:31:14.57	USH	-	-	-	-	Dark measurement started.
13:31:15.54	USH	-	-	-	-	Manual scene recording started.
13:31:15.71	LSH	-	-	-	-	Dark measurement started.
13:31:17.09	USH	-	-	-	-	Dark measurement started.
13:31:18.08	USH	-	-	-	-	Manual scene recording started.
13:31:18.46	LSH	-	-	-	-	Manual scene recording started.
13:31:19.18	SWS	-	-	-	-	Dark measurement started.
13:31:19.83	SWS	-	-	-	-	Manual scene recording started.
13:31:27.04	SWS	-	-	30	-	VIS int.time changed from 10ms to 30ms.
13:31:27.07	SWS	-	-	-	30	NIR int.time changed from 10ms to 30ms.
13:31:30.26	SWS	-	-	50	-	VIS int.time changed from 30ms to 50ms.
13:31:30.28	SWS	-	-	-	50	NIR int.time changed from 30ms to 50ms.
13:31:32.44	SWS	-	-	-	-	Dark measurement started.

13:31:33.59	SWS	-	-	-	-	Manual scene recording started.
13:31:34.87	USH	-	-	-	-	Dark measurement started.
13:31:35.85	USH	-	-	-	-	Manual scene recording started.
13:31:36.86	LSH	-	-	-	-	Dark measurement started.
13:31:39.49	LSH	-	-	-	-	Manual scene recording started.
13:33:56.02	---	-	-	-	-	*** turning
13:34:05.31	SWS	-	-	-	-	Warning: Clipping may be occurring.
13:34:16.58	---	-	-	-	-	*** start of run at Fl 240
13:34:20.80	SWS	-	-	-	-	Dark measurement started.
13:34:22.01	SWS	-	-	-	-	Manual scene recording started.
13:34:30.71	LSH	-	-	-	-	Idling
13:34:30.76	USH	-	-	-	-	Idling
13:34:30.81	SWS	-	-	-	-	Idling
13:34:30.84	USH	-	-	-	-	Idling
13:34:30.86	SWS	-	-	-	-	Idling
13:34:32.84	SWS	-5.5	-	-	-	Telescope sent to 174.500
13:34:34.85	SWS	173.4	-	-	-	Telescope stopped.
13:34:36.16	SWS	-	-	-	-	Manual scene recording started.
13:34:36.19	LSH	-	-	-	-	Manual scene recording started.
13:34:36.21	USH	-	-	-	-	Manual scene recording started.
13:35:30.80	---	-	-	-	-	*** -2 deg
13:42:47.34	SWS	-	-	10	-	VIS int.time changed from 50ms to 10ms.
13:42:47.35	SWS	-	-	-	10	NIR int.time changed from 50ms to 10ms.
13:42:48.92	SWS	-	-	-	-	Dark measurement started.
13:42:49.60	SWS	-	-	-	-	Manual scene recording started.
13:42:51.44	USH	-	-	-	-	Dark measurement started.
13:42:52.35	USH	-	-	-	-	Manual scene recording started.
13:42:53.36	LSH	-	-	-	-	Dark measurement started.
13:42:55.93	LSH	-	-	-	-	Manual scene recording started.
13:42:58.23	SWS	-	-	20	-	VIS int.time changed from 10ms to 20ms.
13:42:58.26	SWS	-	-	-	20	NIR int.time changed from 10ms to 20ms.
13:42:59.69	SWS	-	-	-	-	Dark measurement started.
13:43:00.61	SWS	-	-	-	-	Manual scene recording started.
13:43:02.03	SWS	-	-	-	-	Dark measurement started.
13:43:02.75	SWS	-	-	-	-	Manual scene recording started.
13:43:35.97	---	-	-	-	-	*** end of run will be indicated by telescopes
stopping						
13:44:05.63	USH	-	-	-	-	Idling
13:44:05.66	SWS	-	-	-	-	Idling
13:44:05.79	LSH	-	-	-	-	Idling
13:44:07.91	SWS	174.5	-	-	-	Telescope sent to -5.500
13:44:10.24	SWS	-5.5	-	-	-	Telescope stopped.
13:44:10.90	SWS	-	-	-	-	Manual scene recording started.
13:44:10.91	LSH	-	-	-	-	Manual scene recording started.
13:44:10.94	USH	-	-	-	-	Manual scene recording started.
13:44:24.60	SWS	-5.5	-	-	-	Telescope sent to 0.000
13:44:25.33	SWS	0.0	-	-	-	Telescope stopped.
13:44:28.05	SWS	-	-	-	-	Dark measurement started.
13:44:28.74	SWS	-	-	-	-	Manual scene recording started.
13:44:29.12	USH	-	-	-	-	Dark measurement started.
13:44:30.05	USH	-	-	-	-	Manual scene recording started.
13:44:31.21	LSH	-	-	-	-	Dark measurement started.
13:44:34.01	LSH	-	-	-	-	Manual scene recording started.
13:45:06.71	---	-	-	-	-	*** orbit 7 300
13:46:58.78	---	-	-	-	-	*** end of orbit 7
13:47:02.64	SWS	0.0	-	-	-	Telescope sent to -5.500
13:47:03.48	SWS	-5.5	-	-	-	Telescope stopped.
13:47:25.50	---	-	-	-	-	*** orbit 8 heading n
13:48:05.04	SWS	-	-	-	-	Warning: Clipping may be occurring.
13:49:18.23	---	-	-	-	-	*** end of orbit 8
13:49:31.69	SWS	-	-	-	-	Dark measurement started.
13:49:32.50	SWS	-	-	-	-	Manual scene recording started.
13:49:33.10	USH	-	-	-	-	Dark measurement started.
13:49:34.06	USH	-	-	-	-	Manual scene recording started.
13:49:35.21	LSH	-	-	-	-	Dark measurement started.
13:49:37.80	LSH	-	-	-	-	Manual scene recording started.
13:49:39.95	SWS	-	-	40	-	VIS int.time changed from 20ms to 40ms.
13:49:39.99	SWS	-	-	-	40	NIR int.time changed from 20ms to 40ms.
13:49:43.51	SWS	-	-	50	-	VIS int.time changed from 40ms to 50ms.

13:49:43.52	SWS	-	-	-	50	NIR int.time changed from 40ms to 50ms.
13:49:48.00	SWS	-	-	-	-	Dark measurement started.
13:49:49.30	SWS	-	-	-	-	Manual scene recording started.
13:49:50.21	USH	-	-	-	-	Dark measurement started.
13:49:50.82	SWS	-	-	-	-	Warning: Clipping may be occurring.
13:49:51.04	USH	-	-	-	-	Manual scene recording started.
13:49:51.83	SWS	-	-	-	-	Dark measurement started.
13:49:52.87	SWS	-	-	-	-	Manual scene recording started.
13:49:53.92	LSH	-	-	-	-	Dark measurement started.
13:49:55.70	USH	-	-	-	-	Dark measurement started.
13:49:56.49	USH	-	-	-	-	Manual scene recording started.
13:49:56.56	LSH	-	-	-	-	Manual scene recording started.
13:49:58.46	SWS	-	-	-	-	Dark measurement started.
13:49:59.50	SWS	-	-	-	-	Manual scene recording started.
13:50:00.34	LSH	-	-	-	-	Idling
13:50:00.38	USH	-	-	-	-	Idling
13:50:00.50	SWS	-	-	-	-	Idling
13:50:02.43	---	-	-	-	-	Reset shutters.
13:50:08.89	SWS	-	-	-	-	Manual scene recording started.
13:50:08.91	LSH	-	-	-	-	Manual scene recording started.
13:50:08.92	USH	-	-	-	-	Manual scene recording started.
13:50:12.68	USH	-	-	-	-	Dark measurement started.
13:50:12.70	SWS	-	-	-	-	Dark measurement started.
13:50:12.90	LSH	-	-	-	-	Dark measurement started.
13:50:13.30	SWS	-	-	-	-	Dark measurement started.
13:50:13.66	USH	-	-	-	-	Manual scene recording started.
13:50:14.53	SWS	-	-	-	-	Idling
13:50:15.79	LSH	-	-	-	-	Manual scene recording started.
13:50:18.24	SWS	-	-	-	-	Dark measurement started.
13:50:18.36	LSH	-	-	-	-	Dark measurement started.
13:50:18.47	USH	-	-	-	-	Dark measurement started.
13:50:18.98	LSH	-	-	-	-	Dark measurement started.
13:50:19.56	SWS	-	-	-	-	Idling
13:50:19.64	USH	-	-	-	-	Manual scene recording started.
13:50:21.16	SWS	-	-	-	-	Manual scene recording started.
13:50:21.60	LSH	-	-	-	-	Idling
13:50:23.25	SWS	-	-	-	-	Dark measurement started.
13:50:24.53	SWS	-	-	-	-	Manual scene recording started.
13:50:24.66	USH	-	-	-	-	Dark measurement started.
13:50:25.55	USH	-	-	-	-	Manual scene recording started.
13:50:26.47	LSH	-	-	-	-	Manual scene recording started.
13:50:28.28	LSH	-	-	-	-	Dark measurement started.
13:50:30.90	LSH	-	-	-	-	Manual scene recording started.
13:50:33.48	LSH	-	-	-	-	Dark measurement started.
13:50:36.15	LSH	-	-	-	-	Manual scene recording started.
13:52:00.35	---	-	-	-	-	*** reciprocal run at FL 240
14:05:38.15	---	-	-	-	-	*** end of run
14:05:42.40	LSH	-	-	-	-	Idling
14:05:42.44	USH	-	-	-	-	Idling
14:05:42.63	SWS	-	-	-	-	Idling
14:05:44.28	---	-	-	-	-	Reset shutters.
14:05:47.75	USH	-	-	-	-	Manual scene recording started.
14:05:47.76	LSH	-	-	-	-	Manual scene recording started.
14:05:47.77	SWS	-	-	-	-	Manual scene recording started.
14:05:48.67	SWS	-	-	-	-	Manual scene recording started.
14:05:49.88	USH	-	-	-	-	Dark measurement started.
14:05:49.92	LSH	-	-	-	-	Dark measurement started.
14:05:49.99	SWS	-	-	-	-	Dark measurement started.
14:05:50.76	USH	-	-	-	-	Manual scene recording started.
14:05:51.63	SWS	-	-	-	-	Manual scene recording started.
14:05:52.87	LSH	-	-	-	-	Manual scene recording started.
14:05:55.38	SWS	-	-	-	-	Dark measurement started.
14:05:56.47	SWS	-	-	-	-	Manual scene recording started.
14:05:56.88	USH	-	-	-	-	Dark measurement started.
14:05:57.94	USH	-	-	-	-	Manual scene recording started.
14:05:58.57	LSH	-	-	-	-	Dark measurement started.
14:06:01.11	LSH	-	-	-	-	Manual scene recording started.
14:10:13.72	---	-	-	-	-	*** profile descent
14:10:23.64	---	-	-	-	-	*** profile 14

14:22:05.97	---	-	-	-	-	*** -1 deg
14:22:37.70	---	-	-	-	-	*** 0 deg
14:24:36.78	---	-	-	-	-	*** 1 deg
14:26:53.86	SWS	-	-	-	-	Dark measurement started.
14:26:55.22	SWS	-	-	-	-	Manual scene recording started.
14:26:55.73	USH	-	-	-	-	Dark measurement started.
14:26:56.69	USH	-	-	-	-	Manual scene recording started.
14:26:57.10	LSH	-	-	-	-	Dark measurement started.
14:26:59.80	LSH	-	-	-	-	Manual scene recording started.
14:27:02.34	SWS	-	-	30	-	VIS int.time changed from 50ms to 30ms.
14:27:02.38	SWS	-	-	-	30	NIR int.time changed from 50ms to 30ms.
14:27:04.08	SWS	-	-	-	-	Dark measurement started.
14:27:04.97	SWS	-	-	-	-	Manual scene recording started.
14:27:06.34	USH	-	-	-	-	Dark measurement started.
14:27:07.20	USH	-	-	-	-	Manual scene recording started.
14:27:08.03	LSH	-	-	-	-	Dark measurement started.
14:27:10.79	LSH	-	-	-	-	Manual scene recording started.
14:27:13.18	SWS	-	-	20	-	VIS int.time changed from 30ms to 20ms.
14:27:13.20	SWS	-	-	-	20	NIR int.time changed from 30ms to 20ms.
14:27:15.02	SWS	-	-	-	-	Dark measurement started.
14:27:15.97	SWS	-	-	-	-	Manual scene recording started.
14:27:16.92	SWS	-	-	-	-	Dark measurement started.
14:27:17.74	SWS	-	-	-	-	Manual scene recording started.
14:27:20.53	SWS	-	-	10	-	VIS int.time changed from 20ms to 10ms.
14:27:20.55	SWS	-	-	-	10	NIR int.time changed from 20ms to 10ms.
14:27:21.88	SWS	-	-	-	-	Dark measurement started.
14:27:22.65	SWS	-	-	-	-	Manual scene recording started.
14:27:23.84	SWS	-	-	-	-	Dark measurement started.
14:27:24.66	SWS	-	-	-	-	Manual scene recording started.
14:27:28.81	SWS	-	-	50	-	VIS int.time changed from 10ms to 50ms.
14:27:28.83	SWS	-	-	-	50	NIR int.time changed from 10ms to 50ms.
14:27:30.09	SWS	-	-	-	-	Dark measurement started.
14:27:31.13	SWS	-	-	-	-	Manual scene recording started.
14:27:33.58	SWS	-	-	-	-	Dark measurement started.
14:27:34.62	SWS	-	-	-	-	Manual scene recording started.
14:27:44.94	USH	-	-	-	-	Dark measurement started.
14:27:45.96	USH	-	-	-	-	Manual scene recording started.
14:27:47.27	SWS	-	-	-	-	Dark measurement started.
14:27:48.54	SWS	-	-	-	-	Manual scene recording started.
14:27:48.65	LSH	-	-	-	-	Dark measurement started.
14:27:51.73	LSH	-	-	-	-	Manual scene recording started.
14:39:30.73	---	-	-	-	-	*** start of pirouette
14:39:56.09	---	-	-	-	-	*** piroette 2
14:40:02.87	---	-	-	-	-	*** cooler at 0 deg
14:40:15.73	---	-	-	-	-	*** and has been since 14.37
14:42:16.45	---	-	-	-	-	*** end of piroeutte 2
14:43:21.24	---	-	-	-	-	*** -1 deg

Wet Nephelometer Log

Flight No **B**...373.

Date .13/5/08.....

Operator's name: ...J Bowles...

Page ..1..... of


GMT	Run	Height	Sample flow	Dry neph RH	Wet neph RH	Temp ramp	T _{water}	Remarks
150000	trans	11000						chiller off for trans
151430			12		42	45		chiller on
152900	50ft	50ft	14.8	36	88			peak at 3.0
153327	r1	2300	14.9	28	87	10		approx 1.6 at 85% last run
154040	r1	2300	15.1	30	50	45		quick ramp up ready for profile
154330	p				78%			prof started before 85%
155700	r	4000	14.3	27	85	10		Average 1.4 at 85%
160240	r	4000	14.3	27	54	45		stopped bit early (W/D at 1.0) aim back up by end of run
160520	p5	2300						desnding earlier than expected, only at 75%
165140	r	2400	15.0	43	86	10		go for rh drop.
165920	p9	to 1800	15.3					Got to 50% before run ended.
170111	r7	1800	15.3	35	48	45		back up to 85%
171705		1700	15.3	38	84	10		Average peaks 1.4-1.5
171900						45		back to 85, profile coming
172931		5000ft	14.7	30	88	10		1.4 - 1.6 over last run
173641		5000	14.7	23	49.4	45		Sawtooth coming.. back up, may need to make rapid.
180750		10000		0	80			chiller off. E.O.S.

Flight:

B373

KEY

 Not Fitted

 Fitted, Not Operated

 Duff Data


 Minor Problems

 OK

Thermometers

Cabin Temperature: 

Heimann: 

Deiced Temp: 

Non-deiced Temp: 


Hygrometers


FWVS: 

Buck CR2: 


General Eastern: 


Johnson Williams: 


Nevzorov: 


Total Water Probe: 

Cameras

Downward Facing: 

Forward Facing: 


Rearward Facing: 

Upward Facing: 

Navigation + Aircraft


Cruciform GPS: 


GIN Applanix: 

INU Honeywell: 

Radar Altimeter: 

RVSM IAS: 

RVSM Static Pressure: 

XR5 GPS: 

Misc Core

AMTG: 

AVAPS: 

Cabin Pressure: 

Fax machine: 


Printer: 


S9 Static Pressure: 

Satcom C: 

Satcom H: 

Turb Centre-Static: 

Turb Left Right: 

Turb Up-Down: 

Turb Horizontal Chk: 

Turb Vertical Chk: 


Weather Radar: 


DLUs:

DLU AERACK: 

DLU BBR Lower: 

DLU BBR Upper: 

DLU Core Chem: 

DLU Core Consoles: 

DLU Port Aft: 


DLU Port Fwd: 


DLU Stbd Fwd: 

Radiometers

Lower:


BBR (clear) Lower: 


BBR (IR) Lower: 

BBR (red) Lower: 

Upper:

BBR (clear) Upper: 


BBR (IR) Upper: 


BBR (red) Upper: 

ARIES: 

DEIMOS: 

IR Camera: 

JNO2 Lower: 


JNO2 Upper: 

JO1D Lower: 

JO1D Upper: 

MARSS: 

SHIMS Lower: 

SHIMS Upper: 

SWS: 

TAFTS: 

Cloud Probes

2DC: 

2DP: 

FFSSP: 

PCASP: 

2DS: 

ADA: 

CAPS: 

CCN: 

CDP: 

CIP 100: 

CIP 25: 


CPI: 


CVI: 

SID1: 

SID2: 


Aerosol


CPC 3025A: 

CPC 3786 H2O: 

Filters 47mm: 


Filters 90mm: 

Neph - Dry: 

Neph - Wet: 


PSAP: 

AMS: 

CPC 3025 (AMS): 

INC: 


VACC: 


CPC 3010A (CVI): 

SP2: 


UHSAS: 


Chemistry


CO Aerolaser 5002: 


NOx TE42C: 

Ozone TE49C: 

Ozone TE49: 

SO2 TE43C: 

TDLAS (NIR) CH4: 

TDLAS (NIR) CO2: 

FAGE: 

Formaldehyde: 

NOx FAAM: 

NOxy: 

ORAC: 

PAN: 

PERCA: 

Peroxide: 

PTRMS: 

TDLAS (1C): 

WAS Bags: 

WAS Bottles: 

Misc Non-Core

CASI/ATM: 

LIDAR: 

LTI: 

SAW Hygrometer: 



Faults / Incidents Log

Flight No. B373

Date: 13 May 2008

Instruments

1. INU – not run
2. Digital Video Box – stickle brick no longer holding it up, now resting on keyboard at aft CorCon
3. CO circuit breaker popped two calcs during last third of flight

Instrument Status roundup

Faults: CO Breaker pops.

Aircraft

Nil

ISDN Emails

Nil

Satcom-H Calls

Nil

Issues

Post Flight - Turb Probe Water Traps

1. Indicate Amount of Water: a) Nil b) 1-2 drops c) ¼ full or more d) Ice present
2. Emptied by:
3. Dried by

MISSING LOG SHEETS:

The following log sheets are not available for flight B373:

Log	Reason
Pre-flight log	No log available
Mission Scientist log	Awaiting log from Megan Northway
Core Chemistry / TDLAS	no In Flight log except in cases of instrument problems
2D-S / CAPS / SP2 / CPI	2D-S / CAPS / SP2 / CPI operator does not create a log sheet
AMS log	AMS operator does not create a log sheet
Dry Neph	Operator does not create a log sheet
CVI	CVI was only operated on three flights : B376, B377 & B378
PAN	Operator does not create a log sheet
CCN	Operator does not create a log sheet

Document control

Revision	Date	Author	Comments
r0	25 Jul 2008	Doug Anderson	Initial version missing the above noted logs
r1			
r2			

VIDEO RECORDINGS:

3 x Forward Facing Cameras

3 x Downward Facing Cameras

Further digital video recordings in avi format:

faam-video-dfc_faam_20080513_r0_b373_150235_1hz.avi
faam-video-dfc_faam_20080513_r0_b373_160235_1hz.avi
faam-video-dfc_faam_20080513_r0_b373_170235_1hz.avi
faam-video-dfc_faam_20080513_r0_b373_180235_1hz.avi

faam-video-rfc_faam_20080513_r0_b373_150238_1hz.avi
faam-video-rfc_faam_20080513_r0_b373_160238_1hz.avi
faam-video-rfc_faam_20080513_r0_b373_170238_1hz.avi
faam-video-rfc_faam_20080513_r0_b373_180238_1hz.avi

faam-video-ffc_faam_20080513_r0_b373_150245_1hz.avi
faam-video-ffc_faam_20080513_r0_b373_160245_1hz.avi
faam-video-ffc_faam_20080513_r0_b373_170245_1hz.avi
faam-video-ffc_faam_20080513_r0_b373_180245_1hz.avi

faam-video-ufc_faam_20080513_r0_b373_150242_1hz.avi
faam-video-ufc_faam_20080513_r0_b373_160242_1hz.avi
faam-video-ufc_faam_20080513_r0_b373_170242_1hz.avi
faam-video-ufc_faam_20080513_r0_b373_180242_1hz.avi

Digital8 video recordings from this flight reside with :

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